OSTEOPOROSIS SCREENING IS UNJUSTIFIABLY LOW IN OLDER AFRICAN-AMERICAN WOMEN

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Background: More than one million Americans suffer osteoporotic fractures yearly, resulting in a marked increase in morbidity and mortality. Despite a decrease in bone mineral density with increasing age in all ethnic groups and both genders, preventative and therapeutics efforts in osteoporosis have been focused on caucasian and Asian women. This study assesses the osteoporosis screening practices and the frequency of low bone density in a primarily African-American population of older women.

Methods: Medical records of 252 women at risk for osteoporosis were reviewed for the diagnosis of osteoporosis, prior osteoporosis screening, prior breast cancer screening, and the use of calcium, vitamin D or estrogen. Subsequently, 128 women were assessed for risk factors for osteoporosis, and their bone mineral density was measured using a peripheral bone densitometer.

Results: Osteoporosis screening had been performed in 11.5% of the subjects. Of the women evaluated by peripheral bone densitometry, 44.5% of all women, 40.4% of African-American women, and 53.3% of caucasian women had abnormally low bone density measurements. The frequency of abnormal bone density increased with both increasing age and decreasing body mass index.

Conclusions: Although few women in this population were previously screened for osteoporosis, low bone density occurred in African-American women at substantial rates. Increasing age and low body mass are important risk factors for low bone density in African-American women. Ethnicity should not be used as an exclusion criterion for screening for osteoporosis. (*J Natl Med Assoc.* 2004;96:461–467.)

Key words: osteoporosis ◆ African-American women

INTRODUCTION

Osteoporosis is a metabolic bone disorder that affects more than 25 million Americans.[1] Osteoporosis is characterized by low bone mass, which makes bones fragile and susceptible to fractures.

Approximately one million Americans suffer osteoporotic fractures yearly at a cost of over 14 billion dollars.[2] Currently, most efforts targeted at the prevention and treatment of osteoporosis have involved postmenopausal caucasian women. Although prior data has shown that caucasians and Asians are at increased risk for osteoporosis, more recent data suggests that other ethnic groups are also at significant risk for this disease[3]. The relative protection from osteoporosis in black women may be overemphasized, as many African-American women suffer osteoporotic fractures yearly. Additionally, African Americans have higher mortality rates than caucasians following a hip fracture.[4,5]

Despite an increase in osteoporosis with age in all ethnic populations, screening strategies contin-

ue to be targeted at white women.[6,7] Though African-American women have higher bone densities than caucasian women throughout their life, substantial postmenopausal bone loss, which may lead to osteoporosis, also occurs in black women.[8,9] To date, studies on the prevalence and treatment of osteoporosis have failed to include large populations of African-American women.[7,10] This study examines the frequency of osteopenia and osteoporosis in an urban, primarily black population.

MATERIALS AND METHODS

Setting

This study was completed in the Medicine Clinic at Barnes-Jewish Hospital at the Washington University Medical Center in St. Louis, MO. Approximately 160 internal medicine residents see patients

Table 1. Characteristics of the 252 Subjects in the Retrospective Chart Review

	Number	Percent
Race		
African American	214	85.2%
Caucasian	35	14.0%
Other	3	0.8%
Documented Medical Problems		
Heart disease*	75	29.8%
Hypertension	212	84.1%
Diabetes	91	36.1%
Osteoporosis	18	7.1%
Previous bone densitometry**	29	11.5%
Recent mammography**++	187	74.2%
Prescribing Habits		
Estrogen recommended	137	54.4%
Estrogen use (ever)	79	31.3%
Calcium and/or Vitamin D recommended	97	38.5%
Calcium and/or Vitamin D use (ever)	69	27.4%

* Heart disease includes coronary artery disease, congestive heart failure, or arrhythmia.
** Confirmed by radiology reports
++ Mammography within the last two years

in this urban clinic, which had over 31,000 patient visits in 2000. The clinic serves primarily middle-aged and elderly adults from minority ethnic groups. In 2000, 65% of patient encounters were with adults over the age of 50, including 42% of encounters with adults over 65. Approximately 75–80% of patients seen at this clinic are African American, and 88% have Medicaid, Medicare, or both as their primary form of medical insurance.

Evaluation of Physicians Screening Practices

Initially, a retrospective chart review of 252 female patients was performed. The purpose of the chart review was to determine the osteoporosis screening practices of physicians in this clinic. Breast cancer screening was also reviewed as a marker of the general screening practices for middle-aged and older women in this clinic. A random selection of charts from female patients over the age of 53 who were scheduled for physician appointments between February and April 2000 was examined. Age over 53 years was selected to increase the likelihood that the women were postmenopausal. Only those women who were patients in the clinic for at least six months and had seen a physician on at least three occasions were included. Physicians' notes and patient registration data were used to determine ethnicity. Records were reviewed for a diagnosis of osteoporosis or osteopenia and for recommendations on the use of estrogen, vitamin D, and calcium. Radiology reports from the previous two years were reviewed for evidence of bone mineral density (BMD) testing and mammography. The investigators independently reviewed charts and 50% of the charts were reviewed by two investigators for reliability and accuracy. All radiology reports were verified by one of the investigators.

Measuring Bone Density and Assessing Risk Factors for Osteoporosis

To determine the frequency of decreased bone density, subjects were recruited to be evaluated using a peripheral bone densitometer. Postmenopausal women from the clinic were invited to participate. Recruitment was primarily through flyers posted in the clinic and nurse/physician referral. Eligible participants were postmenopausal women with no history of osteoporosis or fragility fractures. Women taking estrogen were eligible if over the age of 65. These criteria were designed to fol-

low the recent screening recommendations of the National Osteoporosis Foundation.[11] Approximately 2,090 women were eligible by age criteria. One-hundred-forty-seven subjects responded, and 130 subjects completed the assessment. Seventeen subjects who scheduled appointments did not appear for assessment. Two women who were not post-menopausal were excluded from the analysis.

With the assistance of a physician, the participants completed a detailed questionnaire regarding risk factors for osteoporosis. The questionnaire has been used in prior investigations to determine presence or absence of risk factors for osteoporosis. Risk factors assessed included family history of osteoporosis, tobacco use, anticonvulsant use, estrogen use, steroid use, and calcium and vitamin-D intake. The participants' race/ethnicity is reported based on their self-identification.

Peripheral Bone Density

All subjects had their BMD assessed using calcaneal densitometry (Lunar PIXI, GE Medical Systems, Madison, WI). Appendicular measurements have been used to screen for low axial bone density in prior studies and have had a relatively high correlation with central dual-energy x-ray absorptiometry (DEXA)[12,13]. The BMD T-scores generated by the peripheral densitometer are based on the correlations with central DEXA. Based on World Health Organization (WHO) criteria, subjects with BMD between 1.0 and 2.5 standard deviations below the referenced mean for young adults (multiethnic population) were osteopenic and those with BMD 2.5 standard deviations or greater below the referenced mean for young adults were osteoporotic. All subjects with abnormal bone density were referred for central bone densitometry of the hip and spine.
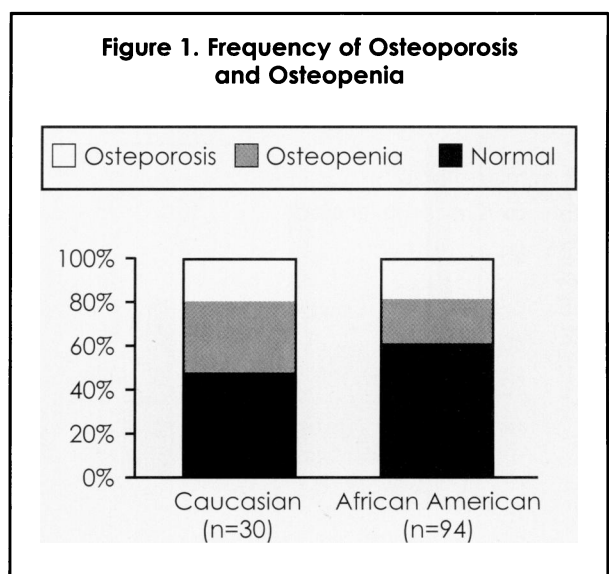
Statistical Analysis

Summary statistics for all demographic and clinical variables were computed for all subjects and separately by ethnic group. In the subjects whose bone densities were measured, individuals were designated as normal, osteopenic, or osteoporotic based on the manufacturers reference ranges for BMD T-scores. Bivariate associations between African Americans and caucasians were assessed using χ^2 (chi-square) analysis. Additionally, each ethnic group was divided into three age groups and four groups by body mass index (BMI). The three age groups were those 65 or younger,

those between age 65 and 75, and those over 75. Subjects were grouped by BMI according to the WHO classification for obesity; BMI less than or equal to 25 is normal, between 25 and 30 is overweight, between 30 and 35 is mild obesity, and greater than 35 is moderate-to-severe obesity[14]. Comparisons of bone densities by diagnosis between age groups and BMI groups also used χ^2 analysis. Multivariate analyses of the demographic and clinical variables were conducted using logistic regression models.

RESULTS

Preventive Medicine and Screening

The demographics of the patients included in the chart review are shown in Table 1. The mean age of the group was 69.6 years (range 53–94). Of the 252 women, only 11.5% had documentation of prior central bone densitometry (DEXA). Nearly 39% of the women were counseled about calcium and/or vitamin-D intake. Recommendations for hormone replacement therapy were documented for 54% of the women. In this same population, 74% of women had recently undergone screening mammography. The difference in the rates of screening for osteoporosis and breast cancer was statistically significant (p<0.001). There was no difference in the rates of DEXA or mammography between blacks and whites in this group (data not shown). For the African-American women, screening mammography was performed significantly

Figure 1. Frequency of Osteoporosis and Osteopenia

☐ Osteporosis ▦ Osteopenia ■ Normal

Caucasian (n=30) African American (n=94)

more often than bone densitometry across all different age groups (Table 2).

Frequency of Osteopenia and Osteoporosis

The characteristics of the 128 women who underwent bone density testing are shown in Table 3. Their mean age was 67 (48–91), mean BMI was 31.4 (16.5–59.3), and mean age at menopause was 46 (21–57). Fifty-seven women (44.5%) had abnormal bone density by calcaneal measurement. Thirty-two women (25.0%) had measurements in the osteopenic range, while 25 (19.5%) were in the osteoporotic range. Caucasian women had a higher rate (53.3%) of abnormal bone density compared to African-American women (40.4%), but the difference was not statistically significant (p=0.35, Figure 1).

The findings were analyzed separately by both age and BMI. Subjects were divided into three age groups: 65 or less (n=50), 66–75 (n=45), and over 75 (n=33). The frequency of abnormal bone density (osteopenic and osteoporotic) increased with increasing age. In the youngest group, 36% of subjects had abnormal bone density compared to 42% in the middle age group and 61% in the oldest group (p=0.01). Figure 2a shows the bone density results by age groups in the cohort of African-American women.

Subjects were grouped by BMI (BMI) according to the WHO classification for obesity.[14] In the African-American population evaluated, BMI was directly correlated with bone density (p<0.001, Figure 2b).

Six-Month Follow-Up

All 57 subjects with abnormal bone density results on peripheral testing were referred for central bone densitometry immediately after the evaluation, and a letter was sent to their primary provider recommending further testing. However, six months after the peripheral testing, only nine participants (16%)—all African American—had undergone central bone densitometry. Central DEXA revealed osteoporosis in five subjects, osteopenia in three subjects, and normal bone density in one subject. The subject with a normal DEXA had a borderline score for osteopenia on peripheral testing.

DISCUSSION

Over the last two decades, the ability to diagnose and treat osteoporosis has dramatically improved. The advances in treatment of osteoporosis have unfortunately been underutilized in non-caucasian populations.[4] Researchers have highlighted that the current guidelines for screening and treatment of osteoporosis are primarily based on data obtained from studies of postmenopausal caucasian women, as insufficient data is available in African-American women.[7,9,10,15] This study provides data regarding the frequency of decreased BMD in African-American women.

The screening practices of the physicians in this investigation may be similar to national physician practices for screening and prevention of osteoporosis in African-American women, since many physicians assume that African-American women

Figure 2. Bone Density Results by Age Group (2a) and BMI (2b) in African-American Women
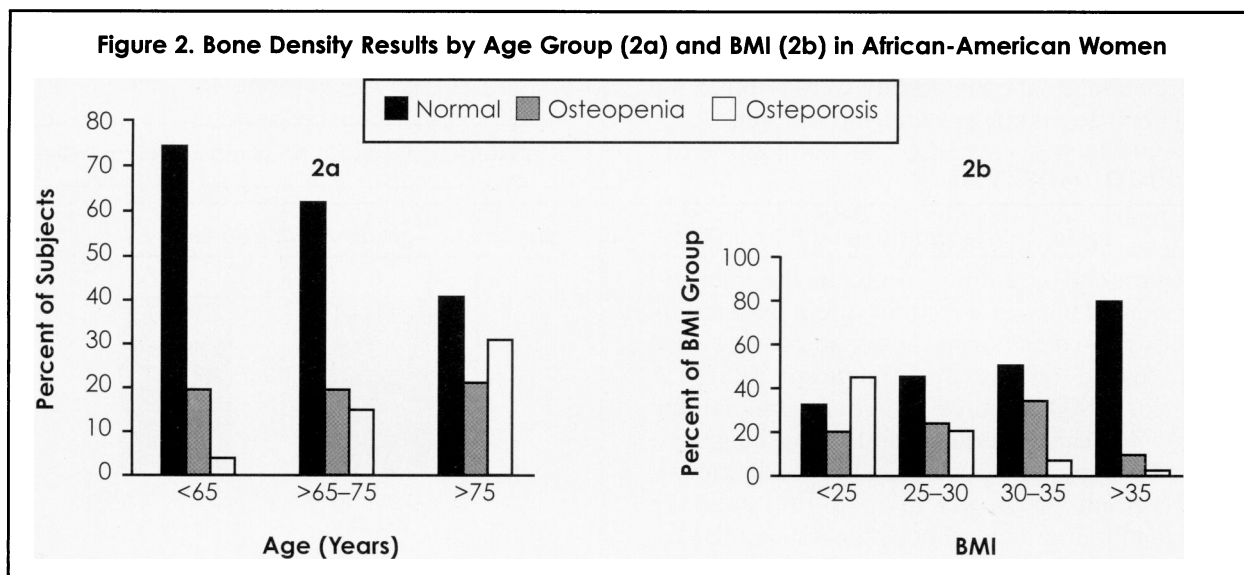
are relatively protected from osteoporosis. The retrospective chart review demonstrated strikingly low rates of osteoporosis screening compared to breast cancer screening in this primarily African-American population. Of particular note, the rates of breast cancer screening in this group compare favorably to prior rates obtained in studies of African-American women, including urban clinics similar to ours.[16-18] As a general measure of the success of screening in this clinic, the rates of breast cancer screening surpassed the goals previously set by the U.S. Department of Health.[19] However, the large majority of women who met the recent National Osteoporosis Foundation guidelines for osteoporosis screening had not undergone bone density testing.[11] The frequency of estrogen use was similar to previous reports.[20] Of note, this study took place prior to the publication of the Women's Health Initiative[21] at which point hormone replacement therapy was considered to be beneficial in women to prevent chronic medical problems, such as osteoporosis and cardiovascular disease.

The frequency of low bone density in the African-American women was approximately 40%—slightly higher than previous studies—while the frequency of low bone density in the caucasian women was similar to previous reports.[22] Although there was no statistically significant difference between these groups, the study was neither designed nor powered to detect a difference. It is, however, apparent that osteoporosis and osteopenia occurred at substantial rates in African-American women. Of note, the WHO criteria for osteoporosis diagnosis were developed using caucasian women, so the use of this criteria in other ethnicities and in males has been questioned. In clinical practice, however, these criteria are routinely utilized.

The two factors associated with low bone density were increased age and low BMI. Linear regression analysis revealed that both age and BMI were independently associated with decreased bone density. The association of osteoporosis with increasing age and low BMI has been well established in caucasian women.[23,24] Advanced age and low body weight were two of the three risk factors the U.S. Preventive Services Task Force's recently updated recommendations included to use in deciding whom to screen.[25] This study concludes that these are two important risk factors for osteoporosis in African-American women as well. While the lower BMI's were associated with low bone density, being overweight and mildly obese was not protective of low bone density. One-half of the women in these weight categories also had low BMD. However, only 18% of women with a BMI greater than 35 had osteopenia and none had osteoporosis. None of the other risk factors examined, including hormone replacement therapy, calcium and vitamin-D intake, physical activity, age at menopause, family history of osteoporosis, and smoking had significant associations with BMD in this study. The lack of an association with bone density and these previously confirmed risk factors in this study may be due to sample size.

A limitation of this study is its small sample size. Although differences were detected among age groups and weight classes, the sample size was not powered to determine whether the rates were different between African Americans and caucasians and whether other established risk factors were predictive of osteoporosis in African Americans. However, even if the frequency of osteoporosis is lower in African-American women compared to caucasian women, it is clearly sizeable enough to warrant consideration of screening.

The use of peripheral bone densitometry is another limitation of the study as central bone densitome-

Table 2. Osteoporosis and Breast Cancer Screening in 214 African-American Women				
	Age Groups			
	Overall (n=214)	<65 (n=76)	65–75 (n=75)	75+ (n=63)
Breast Cancer Mammography	156 (73%)	54 (71%)	60 (80%)	42 (67%)
Osteoporosis DEXA	23 (10.7%)	6 (7.9%)	11 (14.7%)	6 (9.5%)
p value	0.001	0.001	0.010	0.010

Table 3. Characteristics of Subjects Screened by Calcaneal DEXA		
	Number	**Percent**
Race		
African American	94	73.4%
Caucasian	33	25.8%
Native American	1	0.8%
High-school education or higher	77	60.2%
Tobacco use (ever)	62	48.4%
Family history of osteoporosis	14	10.9%
Estrogen use (ever)	29	22.7%

try is the standard screening method for osteoporosis. However, the risk of developing a fracture—the primary adverse event associated with osteoporosis—is increased with low BMD at any site.[26] The National Osteoporosis Risk Factor Assessment Study recently found that women with osteoporosis diagnosed by peripheral bone densitometry had a 2.7-fold increased risk of suffering a fracture within a year compared to those with normal bone density.[27] In addition, calcaneal bone density has recently been shown in a meta-analysis to have a similar degree of predictability for subsequent fractures as bone density measurements of the hip, spine, and distal radius.[28] In this patient population, the rates of central bone density testing were very low in both the general clinic population from the chart review and the subset of patients from the screening trial who had abnormal results on calcaneal measurement and were referred for central testing. The rates of subsequent central bone density testing were quite low despite strong recommendations to both the patients themselves and their referring physicians. Possible explanations for this include a lack of knowledge or understanding of the importance of osteoporosis on the part of both groups, and problems with access or transportation for further testing. Therefore, using peripheral bone densitometry in the office setting may allow larger numbers of patients to be screened for osteoporosis. This may be particularly relevant in urban clinics where transportation and access to care are often limited. The sequential approach to screening with an initial peripheral bone density measurement followed by central bone densitometry in those with abnormal results, as done in this trial, has been identified by the United States Preventive Services Task Force as a possibly useful approach that requires further study.[7]

CONCLUSIONS

The importance of diagnosing osteoporosis is increasingly obvious as fragility fractures continue to be a significant cause of morbidity and mortality. To prevent osteoporotic fractures, clinicians must target the appropriate populations for screening and treatment. This investigation suggests that race should not be used as an exclusion criterion for osteoporosis screening, as low bone density occurs frequently in African-American women. Additional studies are needed to determine if risk factors other than age and BMI are associated with osteopenia and osteoporosis in African-American women and if treatment of low bone density decreases the rate of subsequent fractures. If readily available in the office setting, peripheral bone densitometry may offer an opportunity to increase the rates of osteoporosis screening in minority populations that have low rates of screening.

ACKNOWLEDGEMENTS

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