

The magnitude of Osteoporosis in middle aged women

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ABSTRACT

Objectives: This study aims to increase the body of knowledge regarding osteoporosis in the Jordanian context by investigating the magnitude of osteoporosis amongst perimenopausal women, as well as the risk factors associated with the disease.

Methods: Two hundred and fifty one women between the ages of 40 to 60 years were randomly selected from the Orthopedics and Rheumatology out patient clinics at the Major Teaching Hospital in Amman, Jordan. A structured questionnaire, which focused upon risk factors and preventive measures for osteoporosis, was administered by a trained staff nurse to all women. Index women were then referred to a private hospital, also in Amman, for a dual energy x-ray absorptiometry of the lumbar spine (Lumbar 1-4) and hip.

Results: Results show the magnitude of osteoporosis was 13% according to the bone mineral density of the lumbar spine. Women with osteoporosis were older ($p < 0.00$) and smaller in build ($p < 0.00$) than women with low

or normal bone density. Osteoporotic women were also more likely to be menopausal ($p < 0.00$) and to have taken corticosteroids for a prolonged period of time ($p < 0.00$). Logistic regression showed being menopausal ($p < 0.00$), taking corticosteroids ($p < 0.05$), and having a relatively lower body mass index ($p < 0.00$) were significantly related to being osteoporotic in this group of women.

Conclusion: The authors conclude that this study was not only able to report upon the magnitude of osteoporosis among women sampled, and the risk factors for low bone density, but also raised issues related to inconsistencies in how the health care system deals with women who are at risk for osteoporosis. Study findings are discussed in their socio-cultural context, and implications of the study findings are presented.

Keywords: Osteoporosis, prevalence, menopause, bone density.

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Osteoporosis is a disease typified by low bone mass and a deterioration in bone tissue that leads to increased bone fragility and an increase in fracture risk.¹ Osteoporosis is often called a 'silent disease' as it commonly goes undiagnosed until a person incurs an osteoporosis-related fracture. However, even in cases where fractures do not occur, osteoporosis can debilitate its victims, making daily life tasks nearly impossible. In one recent study osteoporotic women from 11 countries were asked what impact osteoporosis has had on their quality of life. Thirty seven percent of the women responded

that the disease has resulted in back pain, 29% of the women were unable to go for long walks, and 18% stated they were unable to get from place to place.²

In Jordan, with a population of nearly 5000,000, women 50 years and older comprised 4.5% of the total 1994 Jordanian population, a proportion expected to increase to 5% in the year 2004 and 6% in the year 2009.³ This increase in the percentage of women in their post-reproductive years may very well result in the heightened prevalence of osteoporosis, its painful signs, associated fractures, and the concurrent rise in health care costs. Also to

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be expected is a concurrent rise in health care costs associated with the treatment and care of people afflicted with osteoporosis. Jordan is also in the midst of a transition, with lifestyles and eating patterns becoming more westernized. Not only are women becoming more sedentary but their diets are becoming more nutritionally imbalanced, 2 factors that may also combine to create an increasing prevalence of osteoporosis.

There is a large body of literature on osteoporosis, its prevalence and the host of risk factors that are associated with this disease.⁴⁻⁹ Yet, the majority of the research available to us was conducted in developed countries. In developing countries, where women's health services have focused upon maternal and child health issues, little is known regarding the magnitude of osteoporosis in women at risk, the disorder's natural history, or the relevance of risk factors identified in developed countries to the local context.¹⁰⁻¹²

To date, the authors know of only a few studies which have been conducted on osteoporosis in Jordan. As part of a larger study, the principal investigator showed in a community-based study that 15% of women 49 years and above had a bone mineral density (BMD) of the lumbar spine ≤ 2.5 SD's.¹³ The results of another study carried out upon the same group of women indicated that the vitamin D receptor apparently had significant effect on the lumbar spine BMD in the women sampled, with FF homozygotes and FF homozygotes having significantly different BMD Z-scores.¹⁴ Recognizing that the medical community's level of awareness regarding osteoporosis impacts upon the diagnosis and treatment of patients, a 3rd study was conducted focusing upon the knowledge, attitudes and practices of a sample of the Jordanian medical community.¹⁵ The results of this study showed all physicians studied, knew the potential public health problem osteoporosis could cause in Jordan. Yet at the same time, the physicians only knew 2 thirds of some of the common risk factors, and only half of the appropriate clinical management skills for the disease.¹⁵ The level of awareness regarding osteoporosis for the nurses sampled was generally less than that of physicians. The 160 nurses generally knew osteoporosis could pose a public health problem in Jordan. However, nurses did not know when bone mass begins to rapidly decline in women nor what the risk factors are for osteoporosis.¹⁵

This study aims at increasing the body of knowledge with regards to osteoporosis in the Jordanian context by investigating the magnitude of osteoporosis in a selected sample of perimenopausal women, as well as the risk factors associated with this disease.

Methods. Two hundred and fifty one women were sampled from the Orthopedics and

Rheumatology Departments at the main teaching hospital located in Amman, the capital of Jordan. Physicians in the 2 departments referred all consecutive women attending their clinics born between 1940 and 1960 (40 to 60 years old) for inclusion in the study. Exclusion criteria included women who: were not of Arab ancestry, did not permanently reside in Jordan, had dual hip replacement, or were currently recovering from a fracture.

Index women referred to the study were interviewed by the fieldworker, a trained staff nurse in the Orthopedics Department. Women's ages were confirmed verbally before beginning the face-to-face interview, conducted using a structured questionnaire that focused upon risk factors and preventive measures for osteoporosis (Table 1) (Supplement). Physicians referring women from the Rheumatology Department completed a brief form listing the duration of time the drugs that may contribute to osteoporosis had been taken by the particular patient. A record review for drugs was carried out for women referred from the Orthopedics Department. In addition, drug intake history was further supplemented by asking women whether the drugs of interest had ever been taken as patients often appeared to take medication without their referring physician's knowledge. The questionnaire was tested for 3 days prior to the beginning of the study on female patients in the 2 participating hospital departments, after which minor changes were made. During the study period, only one woman referred to the field worker refused to participate in the study.

Women who completed the questionnaire were given a referral appointment to a private hospital, also in Amman, where a dual-energy x-ray absorptiometry (DXA) was performed. All women had their appointment for a bone densitometry within one month from the date when the questionnaire was filled. The BMD in women's lumbar spine (L1-L4) and hip were measured (DXA Fan Beam QDR 4500 A Elite, Hologic). The coefficient of variation for this machine is 1%. Weight and height were measured by a trained DXA technician before women began their bone densitometry. This same technician performed all 251 DXAs.

A total of 251 women completed a questionnaire and a DXA. The DXA reports were given to the women's physicians for proper counseling and therapy, when appropriate. A brochure describing what is osteoporosis, risk factors and prevention techniques was given to all participating women at the end of the face-to-face interview.

The World Health Organization (WHO) definition of osteoporosis, osteopenia and normal bone density is used throughout this study.⁶ Bone mineral density is given as the T-score based upon the United States of America (USA) female caucasian reference population. The USA caucasian reference population

Table 1 - Risk factors and preventative measures for osteoporosis assessed through structured questionnaire, Jordan.

| |
|---|
| Lifestyle factors |
| Adheres to dress code that covers most parts of the body |
| Smoking |
| Inactivity |
| Reproductive Factors |
| Age at first menses |
| Number of pregnancies |
| Number of months breast fed children |
| Breast fed by mother |
| Number of months breastfed by mother |
| Menopausal status |
| Duration of time since onset of menopause |
| Nutritional factors |
| Current dietary calcium sources |
| Dietary calcium intake during childhood |
| Amount of caffeinated and carbonated beverages regularly consumed |
| Genetic factors |
| Positive family history for fractures and osteoporosis |
| Small body frame* |
| Medical History |
| History of previous fracture as a result of minor fall or blow |
| Hysterectomy, oophorectomy or breast surgery |
| Diseases/Medical conditions |
| Benign tumor |
| Cancer |
| Diabetes |
| Heart disease |
| Hypertension |
| Hyperthyroidism |
| Hypotension |
| Kyphosis |
| Rheumatoid arthritis |
| Scoliosis |
| Drugs** |
| Anticoagulants |
| Anticonvulsants |
| Chemotherapy |
| Corticosteroids |
| Insulin |
| Thyroxine |
| Hormone replacement therapy |
| Calcium |
| Vitamin D |
| Biphosphonate |
| Calcitonin |
| *=weight and height measured, |
| **=drug history confirmed by physician or record review |

is used in this study as the reference population as there is no widely accepted reference population for the Middle East at this time. This is also the reference population currently used by the hospital where measurements were taken.

Statistical packaging spreadsheet software (SPSS) was used for statistical analysis.¹⁶ Logistic regression

models for positive diagnosis of osteoporosis were created using the information obtained from the questionnaire. Variables that significantly predicted a BMD ≤ 2.5 SD's are identified.

Results. Of the 251 women, ranging in age from 40 to 60 years, 13% were found to be osteoporotic, 40% osteopenic and 46% had normal bone density in the lumbar spine when compared against the young adult reference population (Table 2). In the hip, only 1% of the women were diagnosed with osteoporosis, 26% with osteopenia and 72% with normal bone density. When the women were divided into age groups, the magnitude of osteoporosis increased with age. T-scores for the lumbar spine indicated 6% of the 40 to 44 year age group were osteoporotic, increasing to 19% of the women in the 55 to 60 year age group (Table 3). Women's BMDs for the lumbar spine were grouped according to the T-score and then comparisons made between the 3 groups of women (osteoporotic, osteopenic and normal) for the various risk factors gathered from the interview questionnaire.

The results show that osteoporotic women were significantly older than women with low or normal BMD, as well as relatively smaller in build (Table 4). Osteoporotic women, however, are still considered obese with an average BMI of 30. The percentage of women who stated they were menopausal also significantly differed between the 3 groups of women, with 91% of osteoporotic women reported being menopausal versus 47% of women with normal BMD (Table 5). For the purposes of this study, the researchers used the WHO's definition of menopause of 12 or more consecutive months since the last menstrual period.¹⁷ A significant relationship also existed between prolonged corticosteroid use and osteoporosis. Osteoporotic women were more likely than women with low or normal bone density to have taken corticosteroids for a prolonged period of time, defined as 3 months or longer (Table 5). The osteoporotic women, however, were not more likely to have been diagnosed with rheumatoid arthritis than the 2 other groups of women.

For the majority of risk factors and preventative measures commonly associated with osteoporosis measured, a significant relationship was not found between the factors and BMD. However, for many of the risk factors and preventative measures the relationship did follow the expected trend in relation to osteoporotic status. For example, only 18% of osteoporotic women exercised regularly as opposed to 32% of women with normal bone density. Twenty seven percent of osteoporotic women had one or more fracture due to a minor fall or blow whereas 13% of normal women reported likewise.

Based upon initial data analysis, menopausal status, age, BMI and corticosteroid use were entered into a logistic regression model, with the independent

Table 2 - Percent magnitude of osteoporosis among sampled women, Jordan (n=251).

| Status | Lumbar spine n % | Total hip n % |
|----------------------------------|---------------------|------------------|
| <i>T-score</i> | | |
| ≤2.5 SDs | 33 (13) | 3 (1) |
| -2.5 <T ≤1 SD | 102 (41) | 67 (27) |
| > -1 SD | 116 (46) | 181 (72) |
| Total | 251 (100) | 251 (100) |
| n=number, SD= standard deviation | | |

Table 5 - Risk factors significantly associated with osteoporosis status, Jordan (n=251).

| Variable | Osteoporotic (n=33) % | Osteopenic (n=102) % | Normal (n=116) % |
|---|-----------------------------|----------------------------|------------------------|
| <i>Menopausal^a</i> | | | |
| Yes | 90.6 | 73.3 | 52.6 |
| No | 9.4 | 26.7 | 47.4 |
| Total | 100 | 100 | 100 |
| <i>Prolonged use of corticosteroids^b</i> | | | |
| Yes | 21.2 | 14.9 | 2.6 |
| No | 78.8 | 85.1 | 97.4 |
| Total | 100 | 100 | 100 |
| a=p<0.00, b=<0.00 | | | |

Table 3 - Magnitude of osteoporosis and osteopenia according to the T-score for the lumbar spine for women by age groups, Jordan (n=251).

| Age Group | Osteoporotic n % | Osteopenic n % |
|---------------------|---------------------|-------------------|
| 40-44 Yrs | 2 (6) | 11 (31) |
| 45-49 Yrs | 5 (10) | 14 (28) |
| 50-54 Yrs | 10 (12) | 36 (44) |
| 55-60 Yrs | 16 (19) | 41 (48) |
| Yrs=years, n=number | | |

variable being the presence or absence of osteoporosis. The study results showed menopausal status, BMI and corticosteroid use were significant predictors of osteoporosis risk (Table 6). Menopausal or post-menopausal women were 7 times more likely to be diagnosed as osteoporotic in this study sample than pre-menopausal women. For each additional year in corticosteroid use, a woman's chance of being osteoporotic increased by 23% for every additional year of use. Finally the model showed that for this group of women, there was a 14% increase in having a T-score ≤2.5SDs for the lumbar spine for every one unit decrease in a woman's BMI.

Table 4 - Risk factors significantly associated with osteoporosis status, Jordan (n=251).

| Factor | Osteoporotic (n=33) | Osteopenic (n=102) | Normal (n=116) |
|---|------------------------|-----------------------|-------------------|
| Mean age (years) ^a | 53.9±5.4 | 52.9±5.3 | 50.3±5.6 |
| Mean height (m) ^b | 1.5±0.1 | 1.6±0.1 | 1.3±0.1 |
| Mean weight (kg) ^a | 72.3±7.8 | 81.9±14.1 | 83.9±15.6 |
| Mean BMI (kg/m ²) ^a | 30.7±3.3 | 34.0±6.3 | 34.2±6.2 |
| n=number, a=p<0.00, b=p<0.05, BMI=body mass index | | | |

Table 6 - Logistic regression model for factors related to women sampled having a T-score ≤2.5 SDs for the lumbar spine, Jordan (n=250).

| Factor | Coeff. | Sig. | OR |
|---|--------|-------|------|
| Menopausal | | | |
| No (reference) | - | - | - |
| Yes | +0.167 | 0.006 | 7.27 |
| BMI (units) | -0.201 | 0.000 | 0.86 |
| Corticosteroid use (years) | +0.139 | 0.017 | 1.23 |
| Coeff=co-efficient, Sig=significance, OR=odds ratio, BMI=body mass index, SD=standard deviation | | | |

Discussion. This study revealed that 13% of all women sampled were osteoporotic according to their T-scores for the lumbar spine, while another 40% of women had low bone density. For women 50 to 60 years of age, the magnitude was 16% and 46%.

When comparing the results of this facility-based study to that of results of larger studies in other countries, we see the magnitude of osteoporosis in these Jordanian women falls within the spectrum of the reported prevalence. For example in the United Kingdom reference data reports a prevalence of osteoporosis at 3.5% among British caucasian women aged 50 to 54.¹⁸ Amongst perimenopausal Dutch women, 4% of the women were diagnosed with osteoporosis and 27% with osteopenia.¹⁹ Ten percent of women living in Hong Kong between the ages of 50-59 were found to be osteoporotic,¹¹ and in Mexico, 16% of women aged 50 and above had osteoporosis.¹² In the USA, 16% of postmenopausal caucasian women are estimated to have osteoporosis in the lumbar spine.⁹ This relatively high magnitude of osteoporosis found in Jordanian women could be attributed to the fact that women in the study were drawn from the Rheumatology and Orthopedic hospital out-patient clinics. As a result the sample represents a selected group of women as opposed to women selected from the general community. However, in a previous community-based study of Jordanian women 49 years and older, the magnitude of osteoporosis according to a DXA of the lumbar spine was 15%,¹³ again at the higher end of the range of osteoporosis prevalence in other countries.

Risk factors that proved to be significantly associated with osteoporosis in this group of women are in agreement with what is cited in international literature. Not only is the relationship between age and osteoporosis well established,^{6,8,11,12,18,19} but so is the association between osteoporosis and menopause,^{5-7,19} obesity^{6,20,21} and long-term corticosteroid use.^{6,22,23} These findings now alert us to the need to pay increasing attention to Jordanian women possessing these risk factors.

In the group of women studied, prophylaxis does not appear to play a prominent role in the prevention of osteoporosis. One case in point are women in this study who have ever taken prolonged corticosteroid therapy. Hormone replacement therapy (HRT) and bisphosphonates are 2 feasible and successful methods for reducing the effect of prolonged corticosteroid use on bone density.¹² Yet in this group of Jordanian women, of the 22 women who took corticosteroids for a prolonged duration of time, only 5 took HRT and one took calcitonin, none of the women took bisphosphonates. There may be several explanations as to why these women have not taken prophylaxis. There is a strong resistance among postmenopausal patients to taking HRT due to its perceived, and real, side-effects. There may have been clinical contraindications for prescribing HRT and

bisphosphonate, or women may not have been compliant once the medication was given to them. Physicians may also be failing to monitor women's bone density so are unaware of a decrease in bone density. This may be linked to a lack of osteoporosis awareness among health care providers, so exploring the effects of corticosteroids on bone density to prevent osteoporosis is not considered. Just as plausible an explanation for only a few women ever taking prophylaxis are lapses in the health insurance schemes that may not cover expensive drug therapy for osteoporosis, or may not make the drug available even if the costs are covered. The issue of prophylaxis in women at risk, such as those on corticosteroid treatment, needs to be addressed by health care providers and health educators to ensure there is a proper understanding of the disease, how it is monitored and therapy administered. The role of policy makers in addressing the implications of a high magnitude of osteoporosis warrants actions directed towards the detection of disease prevalence and creating intervention guidelines.

The premenopausal women in this study who are osteoporotic (4%) or osteopenic (35%) raises the need for a public health awareness and prevention program. Strategies to stave-off a further drastic loss of bone for women who are not yet menopausal could focus upon dietary intake, vitamin supplementation and regular physical exercise. Such a program can also play a major role in advocating policy makers to support research, prevention strategies and programs for osteoporosis.

Limitations. The researchers recognize the study findings are limited in their ability to be generalized to the Jordanian female population aged 40-60 due to the study taking place in the Orthopedic and Rheumatology Departments of a teaching hospital. However, the percentage of women in this study diagnosed as osteoporotic is similar to the result of a previous community-based study in Jordan where 15% of women 49 years and older were diagnosed with a lumbar spine BMD $\leq 2.5SD$.¹³ Nevertheless, the study setting does not limit the significant findings between a woman being diagnosed with osteoporosis and the measured risk factors.

In conclusion, this study was not only able to report upon the magnitude of osteoporosis amongst a sample of women attending these 2 hospital out-patient clinics and the risk factors for low bone density, but raised issues related to inconsistencies in how the health care providers and the system as a whole deals with women who are at risk for osteoporosis. This suggested change therefore needs to occur on several levels within the general community, amongst health care professionals, and within policy making circles. The change that can have the greatest impact upon osteoporosis, and yet is the relatively least expensive program that can be

undertaken on a large scale, are awareness programs targeting girls 9-18 years that emphasize the importance of regular physical exercise and a balanced diet. Not only does the development of these important eating and exercise patterns early on increase the chance that young women will reach their peak BMD, but establishes healthy lifestyle patterns that can last with young women throughout their lives.²⁴ Despite the fact that Jordan's population is currently relatively young, the country is experiencing an increase in the proportion of elderly citizens, and therefore an increase in the number of people who can be afflicted with osteoporosis. Now is the time for the country to take action in establishing reference BMDs for Jordanians to assess osteoporosis and properly manage the disease. This, along with several other measures, can work towards preventing osteoporosis from becoming a public health problem in the future.

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