INTRODUCTION

Low bone mineral density comprises osteopenia and osteoporosis. Osteopenia is considered as a precursor to osteoporosis but not every person diagnosed with osteopenia necessarily develop osteoporosis [1-3]. More specifically, osteopenia is defined as a bone mineral density T-score lower than -1.0 and greater than -2.5, whereas osteoporosis is defined as a bone mineral density T-score of -2.5 or lower [4].

Both osteopenia and osteoporosis occur more frequently in post-menopausal women as a result of the loss of estrogen [5,6]. These conditions are also worsened by unhealthy lifestyle/behavioral factors including physical inactivity, excessive alcohol consumption, smoking, or prolonged use of glucocorticoid medications [1,7,8]. Osteopenia can also be a consequence of exposure to radiation [1].

In principle, osteopenia is a sign of normal aging, in contrast to osteoporosis which is present in pathologic aging [1,5].

In the United States, about ten million women and men already have osteopenia and another 34 million people are at high risk for developing osteoporosis [9]. Furthermore, osteoporosis leads to more than 1.5 million osteoporotic fractures every year in US [9], including about 300,000 hip fractures and about 700,000 vertebral fractures [10].

The assessment of bone mineral density is usually done with X-rays, a procedure referred to as dual X-ray absorptiometry (DEXA) [11]. However, assessment of bone mineral density can be also conducted with portable scanners using ultrasound, and portable machines can measure density in the heel [12,13]. Indeed, quantitative ultrasound is being used worldwide, due to its low cost, simplicity of performance, mobility and, importantly, due to the lack of ionizing radiation [12].

The information about the prevalence and the associated factors of low bone mineral density including osteopenia and osteoporosis from Albania is scant. Hence, to date, there are no scientific reports about the magnitude and distribution of bone mineral density in population-based studies in Tirana and other major districts in Albania, a transitional country in the Western Balkans which has been characterized by a particularly difficult political and socioeconomic situation in the past twenty five years [14].

In this context, our aim was to assess the prevalence and demographic and socioeconomic determinants of low bone mineral density in Tirana, the capital city of Albania, a transitional former communist country in South Eastern Europe.

METHODS: We conducted a cross-sectional study in Tirana city in 2010 including a population-based sample of 549 women aged 35 years and over (overall response rate: 92%). The presence of low bone mineral density (osteopenia and/or osteoporosis defined as a bone mineral density T-score less than -1) among study participants was assessed with a bone ultrasound device which is simple and easy to use for screening of bone mineral density in population-based studies. Binary logistic regression was used to assess the association of low bone mineral density with demographic characteristics and socioeconomic factors among study participants.

RESULTS: Overall, the prevalence of osteopenia and/or osteoporosis in this representative sample of women in Tirana was 28.4% (N=156). In multivariable-adjusted logistic regression models, low bone mineral density was significantly related to older age of women (OR=3.7, 95%CI=2.2-6.3, P<0.001), unemployment status (OR=1.8, 95%CI=1.1-3.1, P=0.02) and a lower educational level (OR=3.5, 95%CI=1.9-6.4, P<0.001).

CONCLUSION: Our findings provide important evidence about the prevalence and demographic and socioeconomic factors associated with low bone mineral density among adult women residing in Tirana. Vulnerable participants in terms of demographic profile (older age), and a lower socioeconomic status (lower education and unemployment) had a significantly higher prevalence of low bone mineral density in this representative sample of women in Tirana.

Keywords: Albania, bone ultrasound, bone mineral density, osteopenia, osteoporosis, Tirana.
The presence of low bone mineral density (defined as a bone mineral density T-score less than -1 that is osteopenia and/or osteoporosis) among study participants was assessed with a bone ultrasound device which is simple and easy to use for screening of bone mineral density in population-based studies [12,13]. Hence, ultrasound is considered as a quick, cheap and non-radiating device for assessing bone quality [12,13].

In addition, demographic information (age and marital status of study participants) and data on the socioeconomic status (employment status and educational attainment) were collected for all women included in this study.

Binary logistic regression was used to assess the association of low bone mineral density (outcome variable) with demographic characteristics and socioeconomic factors (independent variables). Crude (unadjusted) odds ratios (ORs) and their respective 95% confidence intervals (95%CIs) were initially calculated. Subsequently, all the demographic and socioeconomic characteristics were entered simultaneously into the logistic regression models. Multivariable-adjusted ORs and their respective 95%CIs were calculated. In all cases, a p-value of ≤0.05 was considered as statistically significant. Statistical package for Social Sciences (SPSS, version 15.0) was used for all the statistical analyses.

RESULTS

Table 1 presents the distribution of demographic characteristics and socioeconomic factors among women included in this study by their bone mineral density status. On the whole, the prevalence of low bone mineral density (osteopenia and/or osteoporosis) in this representative population-based sample of women in Tirana was 156/549=28.4%. The proportion of older individuals (>50 years) was significantly higher among women with low bone mineral density compared with those with normal bone mineral density (87.2% vs. 63.4%, respectively; P<0.001). Women with osteopenia and/or osteoporosis had a higher prevalence of unemployment compared with those with normal bone mineral density (20.5% vs. 15.3%, respectively) – a finding which was borderline statistically significant (P=0.09). Furthermore, women with low bone mineral density had a higher level of marriage compared with women with normal bone mineral density (84.0% vs. 77.9%, respectively) – a finding which was also only borderline statistically significant (P=0.07). Finally, the proportion of a lower educational attainment was considerably higher among women with low bone mineral density compared with their counterparts with normal bone mineral density and this finding was statistically significant (23.1% vs. 8.7, respectively; P<0.001) (Table 1).

Table 2 displays the association of low bone mineral density with demographic characteristics and socioeconomic factors of the women included in this study. In crude (unadjusted) logistic regression models, there was evidence of a strong and statistically significant association of low bone mineral density with older (>50 years) age (OR=3.9, 95% CI=2.4-6.6, P<0.001). Unemployed women had a non-significantly higher “risk” of osteopenia and/or osteoporosis compared with their employed counterparts (OR=1.4, 95% CI=0.9-2.3, P=0.14). Similarly, married women had a non-significantly higher risk of low bone mineral density than women who were currently not married (OR=1.5, 95%CI=0.9-2.3). On the other hand, the odds of a lower educational attainment were considerably higher among women with low bone mineral density compared with those with normal bone mineral density (OR=4.1, 95%CI=2.3-7.4, P<0.001).

In multivariable-adjusted logistic regression models, low bone mineral density was significantly related to older age (OR=3.7, 95%CI=2.2-6.3, P<0.001), unemployment status (OR=1.8, 95%CI=1.1-3.1, P=0.02) and a lower educational level (OR=3.5, 95%CI=1.9-6.4, P<0.001) (Table 2).

DISCUSSION

Our study provides new evidence about the prevalence and demographic and socioeconomic factors associated with low bone mineral density in women in Tirana, the capital city of Albania. Overall, the prevalence of low bone mineral density in this representative sample of women in Tirana was 28.4%. Significant correlates of low bone mineral density among women in this survey included older age, unemployment and a lower educational attainment.

Our findings related to the main determinants of low bone mineral density are generally in line with previous reports from the international literature [1,4,6]. In our study, vulnerable women in terms of a lower socioeconomic status had a higher “risk” of a low bone mineral density (osteopenia and/or osteoporosis).

In addition, in our study, there was evidence – albeit borderline statistically significant – of a higher “risk” for low
Table 2 - Association of low bone mineral density with demographic characteristics and socioeconomic factors among women in Tirana, Albania

<table>
<thead>
<tr>
<th>Variable</th>
<th>Crude (unadjusted models)</th>
<th>Multivariable-adjusted models</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR (95%CI)</td>
<td>P*</td>
</tr>
<tr>
<td>Age-group:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤50 years</td>
<td>1.00 (reference)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>&gt;50 years</td>
<td>3.93 (2.36-6.56)</td>
<td>3.72 (2.19-6.32)</td>
</tr>
<tr>
<td>Employment:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td>1.00 (reference)</td>
<td>0.139</td>
</tr>
<tr>
<td>Unemployed</td>
<td>1.43 (0.89-2.31)</td>
<td>1.84 (1.09-3.11)</td>
</tr>
<tr>
<td>Marital status:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single/divorced/widowed</td>
<td>1.00 (reference)</td>
<td>0.112</td>
</tr>
<tr>
<td>Married</td>
<td>1.46 (0.92-2.33)</td>
<td>1.57 (0.96-2.58)</td>
</tr>
<tr>
<td>Educational level:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>1.00 (reference)</td>
<td>&lt;0.001 (2)</td>
</tr>
<tr>
<td>Middle</td>
<td>1.51 (0.98-2.35)</td>
<td>0.64</td>
</tr>
<tr>
<td>Low</td>
<td>4.12 (2.29-7.43)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

* Odds ratios (OR: low bone mineral density vs. normal bone mineral density), 95% confidence intervals (95% CIs) and p-values from binary logistic regression.
† Overall p-value and degrees of freedom (in parentheses).

Bone mineral density among married women compared with those who are single. This is compatible with previous reports in the international literature [1,6]. Marriage is associated with pregnancy and breastfeeding of the newborns which are both factors that decrease the bone mineral density [4]. Therefore, it is logical to assume a higher risk of osteopenia and/or osteoporosis among married women compared with women who are single.

Furthermore, in our study, we obtained evidence of a particularly strong relationship of osteopenia and/or osteoporosis with age. This is in line with previous reports from the international literature which have convincingly linked older age with a lower bone mineral density [1,6,15]. Our study may have several limitations. On the face of it, our analysis included a representative sample of women residing in Tirana. Yet, we cannot rule out entirely the possibility of selection bias in our study sample. Furthermore, women residing in Tirana do not represent all the Albanian women and, therefore, we cannot generalize our findings to the overall female population in Albania. In addition, we used an internationally validated instrument for assessment of low bone mineral density in population-based studies. From this point of view, findings from the quantitative ultrasound measurements of bone mineral density have been shown to correlate well with the dual energy X-ray absorptiometry (DXA) [12], which constitutes one of the most widely validated tools to measure BMD in clinical practice [11]. However, the information obtained through the interview may have been subject of different types of information bias. This may be especially relevant for the socioeconomic characteristics of study participants. In any case, there is no reason to assume differential reporting of marital status, employment status or educational level among women distinguished by the bone mineral density status in this study.

In conclusion, our study provides useful evidence about the prevalence and demographic and socioeconomic correlates of low bone mineral density in Tirana. Vulnerable women in terms of demographic profile (older age), and a lower socioeconomic status (lower education and unemployment) were significant correlates of low bone mineral density in this representative sample of women in Tirana. However, there is a need to conduct future nationwide population-based studies in order to assess the prevalence and the main predictors of osteoporosis and osteoporosis in transitional Albania.

Conflicts of interest: None declared

References
2. World Health Organization. WHO scientific group on the assessment of osteoporosis at primary health care level. Summary meeting report; 2004;