Osteoporosis and Somatization of Anxiety

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Abstract

Chronic stress can now be physiologically traced as a significant player in the creation of osteoporotic bones. The present pilot study involved 100 women (N = 42 have been diagnosed with osteopenia, N = 21 have been diagnosed with osteoporosis, N = 37 had a non-osteoporotic condition) who participated in the Hellenic Society of Osteoporosis Association Support. Correlations between somatic symptoms of anxiety and osteoporosis, and among medications and somatization in women were explored. Assessments were based on a self-report demographic questionnaire and on the Short Anxiety Screening Test (SAST) administered for detection of anxiety disorder and somatization. Statistical analysis detected non-significant differences regarding the correlation between anxiety symptomatology or somatization due to osteoporosis and osteopenia diagnosis. The same pattern is observed among women’s age group, the occupational and marital status. Hypothesis that the osteoporosis and osteopenia group would manifest significant relationships with the age group and medicines was confirmed, as well as between somatization and medicines that women with osteoporosis and osteopenia undertake. The results suggest that women are not prone to manifest anxiety or somatization in relation to the osteoporosis condition. However, the majority of women with osteoporosis and osteopenia consume more than two medicines other than those for osteoporosis. This quantity and combination they undertake appear to contribute and deteriorate their anxiety/somatization symptomatology. Further research based on a larger sample would give more definite results.

Keywords: women, osteoporosis, medicines, anxiety, somatization

Introduction

A high stress lifestyle has always been suspected as one of the contributing causes of osteoporosis and other major health problems. According to Kumano (2005), there may be three ways of relationship between stress and osteoporosis. The first is that stress induces some physiological changes leading to osteoporosis. The second is that stress induces behavioral distortion of eating, drinking, exercise, and sleep habits, which leads to osteoporosis. The third is that osteoporosis, on the other hand, brings about anxiety, depression, loss of social roles, and social isolation, which leads to stress. Postmenopausal and young women form the susceptible sex and age groups.

But what is really happening inside the body as a result of high stress living and how does it affect bones? Constant stress promotes an unhealthy hormone shift increasing cortisol and reducing serotonin levels. Higher cortisol levels increase total body inflammation decreasing calcium absorption and increased calcium excretion. Osteoblasts (bone-building cells) are reduced in number impairing the bones ability to renew which is essential to maintaining normal bone density. Stress causes less bone to be created and more bone to be destroyed resulting in osteoporosis. There are two types of stress responses in our lives, a short term response and a long term response. The short term response is considered to be governed by the sympathetic nervous system. The long term response characteristically involves the release of glucocorticoids, namely cortisol (Baek et al., 2010). The role of stress is
described in the work of Chiodini and his colleagues (Chiodini, Tortolano, Carnevale, Trischitta, & Scillitani, 2008). Based on their study, cortisol excess inhibits bone formation, increases bone resorption, impairs calcium absorption from the gut, and affects the secretion of several hormones (in particular gonadotropins and GH), cytokines, and growth factors, influencing bone metabolism. The authors note as well that, subclinical hypercortisolism, a condition of impaired hypothalamic-adrenal axis homeostasis without the classical signs and symptoms of glucocorticoid excess, is a recently defined entity, which has been shown to be associated to increased bone resorption, bone loss, and high prevalence of vertebral fractures regardless of gonadal status (Chiodini et al., 2008).

Thus, negative emotions, such as depression or anxiety, can directly affect the cells of the immune system and either up-or down-regulate the secretion of proinflammatory cytokines. In addition, negative emotions may also contribute to prolonged or chronic infections or to delayed wound healing, processes that indirectly fuel proinflammatory cytokine production. These changes are likely to be greatest and to carry the highest health risks, among the elderly, who already show age-related increases in interleukin 6 (IL-6) production (Cohen, 2000). Indeed, inflammation has recently been linked to a spectrum of conditions associated with aging, including cardiovascular disease, osteoporosis, arthritis, Type 2 diabetes, certain lymphoproliferative diseases or cancers (including multiple myeloma, non-Hodgkin’s lymphoma and chronic lymphocytic leukemia), Alzheimer’s disease, and periodontal disease (Ershler & Keller, 2000). Chronic inflammation has been suggested as one key biological mechanism that may fuel declines in physical function, leading to frailty, disability, and, ultimately, death (Cohen, Pieper, Harris, Rao, & Currie, 1997; Hamerman, 1999; Taaffe, Harris, Ferrucci, Rowe, & Seeman, 2000).

This should bear in mind as individuals and especially the female gender consider a number of ways to maintain good bone health and prevent osteoporosis. For this reason effective treatment programs for healthy bones must include mechanisms to prevent the negative effects of stress on woman’s body. Reducing the negative effects of stress on the body will help the cells responsible for healthy bones begin to function normally again. In a nutshell, the time spent promoting good mental wellbeing is as important as caring for good physical health.

The present study aims at shedding light and exploring the links and correlations that can be established between somatization and osteoporosis in women. The research hypothesis is that anxiety precipitates osteoporosis in some women, which acts as a predisposing factor for osteoporosis. This means that women with diagnosed osteoporosis might have a high likelihood of manifesting somatic symptoms of anxiety. Specifically, they have difficulty controlling their anxiety because of their osteoporosis as well. What is more, it is investigated the extent to which the consumption of a variety of medications can have a considerable effect on the positive symptomatology of somatized anxiety.

Method

Participants Characteristics

The study group was a total of 100 women, who were involved in the actions of the Hellenic Society of Osteoporosis Association Support, a non-profit organization, officially recognized by the International Osteoporosis Foundation (IOF) and the World Health Organization (WHO). The participants of the study were assigned to three distinct categories according to their osteoporotic diagnosis. The first group was women with osteoporosis (N = 21), the second group was women with osteopenia (N = 42) and the third group was women with a non-osteoporotic condition (N = 37). The age mean for the total sample was $M_{age} = 56$, $SD = 12.47$. Based on women’s age and their osteoporosis condition three age categories were formed with women belonging to the following age groups:
18-44, 45-54 and 55-80 respectively. Women indicated their marital and occupational designations. The majority of women was married (67%) and employed (57%), followed by categories of unemployed (43%), single (18%), widowed (9%) and divorced women participants (6%).

**Psychometric Instruments**

**Demographic Information Sheet** — A Demographic Information Sheet was used in eliciting demographic and situational information including: women’s age, their marital and employment status, their current health in relation to the osteoporotic diagnosis and the consumption of a series of medications prescribed to them apart from the osteoporotic medicines. These medications were prescribed for heart, pressure or cholesterol symptomaticity, diabetes, respiratory or asthma conditions, gastrointestinal complaints, thyroid dysregulation and for psychiatric indications.

**Short Anxiety Screening Test** — The Short Anxiety Screening Test (SAST) was developed to provide clinicians with a simple tool for detecting anxiety disorders in older people. It was developed and standardised in by Sinoff, Ore, Zlotogorsky, and Tamir (1999) and was considered appropriate for our study purpose for the following reasons: it is short and easy to apply in clinical settings and it is based on an interviewer-assisted self-rating scale which was developed to standardize the detection of anxiety disorder, rendering it practical for use in everyday practice. According to the developers, the instrument can accurately and reliably identify symptoms of anxiety in older people even, and especially, in the presence of depression. The scale is comprised of 10 items including somatic complaints, often the manifestation of anxiety in the older population (Sinoff et al., 1999).

SAST fulfills the criteria defined by the Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM-IV) and contains questions relating to somatic symptoms, often the manifestation of anxiety (American Psychiatric Association, 2000). Indicative questions are the following: “Do you feel keyed up, on edge?”, “Do you feel that something terrible is going to happen?”, “Are you worrying about your present state?”, “Do you feel you have control of your life?”, “Can you relax?”, “Do you suffer from back pain, neck pain and headache?”, “Do you sweat a lot or suffer from palpitations?”, “Have you been irritable?”, “Do you sleep well?”, “Do you suffer from dizziness of faintness?” The scale consists of 10 items rated on a 4-point response scale, ranging from 1 (rarely or never), 2 (sometimes), 3 (often) to 4 (always), and generating scores between 10 and 40, with a higher score equalling a higher degree of anxiety. SAST requires 10 to 15 min to administer and a total score is calculated by the sum of the grades of all questions. A score of ≥ 24 is the cut-off point for the diagnosis of anxiety, while a score of 22 to 23 reflecting borderline test results (Grammatikopoulos et al., 2010).

The research study was based on the Greek version of the Short Anxiety Screening Test (SAST). This adaptation of the SAST questionnaire is comparable with that of the original version in terms of reliability and can be used in primary healthcare research settings. The psychometric properties of the Greek version of the SAST scale in primary care were good. Internal consistency of the instrument was good, the Cronbach α was found to be .763 (p < .001) and ICC (95% CI) for reproducibility was found to be .763 (.686 to .827). Factor analysis revealed three factors with eigenvalues > 1.0 accounting for 60% of variance, while the Cronbach α was > .7 for every item. Its use in clinical practice should be primarily administered as a screening tool only at this stage, with a follow-up consisting of a detailed interview with the patient, in order to confirm the diagnosis (Grammatikopoulos et al., 2010).
Statistical Analysis

All statistical analyses were performed using the Statistical Package for Social Sciences (SPSS version 20.0). The social-demographical characteristics of the sample were summarized using descriptive statistics. Chi-square test ($\chi^2$) was used to examine differences with categorical variables for estimating how closely an observed distribution matches an expected distribution and whether two random variables are independent or not. Analysis of variance (ANOVA) procedures were implemented with Bonferroni corrections, since the study involved three levels of the osteoporotic status as the independent variable that examined the differences between group means and variation among and between groups.

Results

The first hypothesis, that the osteopenia and osteoporosis group would exhibit significantly higher proportions of somatised anxiety in comparison to the non-osteoporotic women was not supported. This means that osteoporotic women and women with osteopenia do not differ from the non-osteoporotic women across the dimensions of anxiety. In other words, women with an osteoporotic and osteopenia diagnosis do not present a vulnerability to express somatic symptoms of anxiety in contrast with the undiagnosed women (Table 1). The same finding was observed among their age group, the occupational and marital status.

Table 1

<table>
<thead>
<tr>
<th>Categorical variables</th>
<th>% Osteoporosis (N = 21)</th>
<th>% Osteopenia (N = 42)</th>
<th>% Non-osteoporotic (N= 37)</th>
<th>% Total</th>
<th>$\chi^2$ (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age group</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>16.77 (.002)**</td>
</tr>
<tr>
<td>18-44</td>
<td>0</td>
<td>3</td>
<td>11</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>45-54</td>
<td>2</td>
<td>9</td>
<td>9</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>55-80</td>
<td>19</td>
<td>30</td>
<td>17</td>
<td>66</td>
<td></td>
</tr>
<tr>
<td>Medicines</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>11.18 (.025)*</td>
</tr>
<tr>
<td>Nothing</td>
<td>2</td>
<td>10</td>
<td>17</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>8</td>
<td>17</td>
<td>7</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>More than 2</td>
<td>11</td>
<td>15</td>
<td>13</td>
<td>39</td>
<td></td>
</tr>
<tr>
<td>SAST Result</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.619 (ns)</td>
</tr>
<tr>
<td>Positive</td>
<td>7</td>
<td>16</td>
<td>11</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>Negative</td>
<td>14</td>
<td>26</td>
<td>26</td>
<td>66</td>
<td></td>
</tr>
</tbody>
</table>

Note. ns = non-significant.
*p < .05. **p < .01.

However, the hypothesis examining the relationship between medicines, osteoporosis somatization and age group was affirmed, by giving statistically significant relationships (Table 1). More specifically, women who belonged to the older age group, ranging from 55-80, had been diagnosed with osteopenia and osteoporosis. Therefore, the older a woman is the higher is the possibility of gaining an osteoporotic diagnosis [$\chi^2(4, N = 100) = 16.77, p < .01]$). Thus, prescription and consumption of medications in this age group is a common phenomenon. Significant causative relationships were discovered among osteoporosis and medications [$\chi^2(4, N = 100) = 11.18, p < .05]$ and between somatization of anxiety and medications women undertake [$\chi^2(2, N = 100) = 8.54, p < .01]$.

These findings lead to the assumption that the quantity and the combination of medicines osteoporotic women consume deteriorate their anxiety symptomatology compared with the non-osteoporotic group. What is more,
women with osteopenia and osteoporosis tend to consume a variety of medications (more than two) for other health problems apart from osteoporosis unlike the non-osteoporotic women. The main effect of medicines on sleep pattern or severity of sleep disturbance \( [F(2,97) = 4.749, p < .01] \) and dizziness/faintness indications \( [F(2,97) = 6.308, p < .01] \) were found to be significant among the osteopenia and osteoporosis group (Table 2). These outcomes propose that women with osteoporosis and osteopenia who belong to the older age group (55-80 years of age) tend to consume more than two medicines apart from osteoporotic ones, and have higher degrees of somatized anxiety symptoms as a causal effect and attribute of medications.

<table>
<thead>
<tr>
<th>Source of variance</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Severity of sleep disturbance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between-subjects effects</td>
<td>10.926</td>
<td>2</td>
<td>5.460</td>
<td>4.750</td>
<td>.011**</td>
</tr>
<tr>
<td>Within-subjects effects</td>
<td>111.584</td>
<td>97</td>
<td>1.150</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Dizziness/Faintness Symptoms</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between-subjects effects</td>
<td>8.637</td>
<td>2</td>
<td>4.319</td>
<td>6.308</td>
<td>.030*</td>
</tr>
<tr>
<td>Within-subjects effects</td>
<td>66.403</td>
<td>97</td>
<td>.685</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. SS = sum of square; MS = mean squares.
*p < .05. **p < .01.

### Discussion

Somatization is generally defined as the tendency to express emotional dysphoria with physical signs (Spin¬hoven & van der Does, 1997). In somatisation, psychosocial or emotional problems are expressed with physical signs, such signs are attributed to a physical disease, and medical assistance is sought (Ford, 1986). While no consensus has been reached on its definition and classification, the common expression used for somatization is the presence of physical complaints that cannot be explained by a somatic disease (Ford, 1986). Somatization is primarily the wide scoped clinical phenomenon of the somatic signs that are defined with mental processes instead of structural or somatic disorders. While somatization may also be a temporary complaint or primary symptom of many psychological diseases, it may also be a somatic stress expression influenced by culture and social life as a way of learned behavior, an exaggerated manner of discourse of an organic disorder, the use of certain medications that induce somatized-anxiety like symptoms or a representation of some personal characteristics (Bitzer, 2003; Kirmayer & Young, 1998).

The study revealed that women are not prone to manifest anxiety or somatization in relation to the osteoporosis condition. However, the majority of those with osteoporosis and osteopenia consume more than two medicines other than osteoporosis. As a consequence, the potent interaction and interplay that medicines inflict on their biopsychological organism worsen the somatisation process. Specifically, questions of the Short Anxiety Screening Test (SAST) that examined sleep patterns ("Do you sleep well?") and dizziness/faintness ("Do you suffer from dizziness/faintness?") constructed statistical significant relationships with the medications as the dependent variables for their impact on the anxiety symptomatology.

The above results can be interpreted from the perspective of viewing the sympathetic nervous system, as the fight or flight mechanism of the human body that plays a crucial role in this process. Drugs that may trigger anxiety
symptoms will often affect the sympathetic nervous system. This large group of drugs are called sympathomimetics that include alpha-1 agonists, such as phenylephrine contained in nasal decongestants, or beta agonists, such as albuterol contained in inhalers that are used in asthma. In addition to the sympathomimetics, other drug classes may give rise to anxiety symptoms. These include corticosteroids that may be used orally or intravenously in conditions such as asthma or multiple sclerosis, as well as other drugs, such as thyroid hormones. In addition to these major classes of drugs that cause anxiety symptoms, other drugs such as anticholinergic agents, anticonvulsants, antihistamines, insulin, oral contraceptives, antihypersensitive and cardiovascular medications, antidepressant, anxiolytic pharmacotherapy may also give rise to anxiety (Augustin, 2005; Cates, Wells, & Thatcher, 1996; Kirkwood & Melton, 2002). Women who participated in the study recognized and identified the consumption of the above major classes of drugs, which they had a direct impact in their tendency to somatise.

Strengths and Limitations

The findings from this study approach the subject within a biomedical paradigm, but within this paradigm explores how women’s anxiety symptomatology is exacerbated by the range of medicines they take. There appears to be an argument around the over-medicalisation effect on women’s psychological well-being. Even though, the study highlights the causal relationship between medicines and somatization, there are some limitations that warrant discussion.

Initially, the sample consisted of 100 women who were active members of the Hellenic Society of Osteoporosis Association Support. This means that the participants were selected from a specific target group by excluding osteoporotic women who were not participants of the Association. Another fact is that other psychosocial factors, such as psychiatric history, physical illness and social support should be considered in the future study, as they might interfere with the relationship between anxiety and medications. Further research with bigger and random sample is required in order to clarify and generalize through representativeness the results.

References


