Bone Mineral Density and Body Composition Assessment In Individuals with Severe Mental Illness

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Abstract. Bone Density among the average population has been researched however little has been reported on the effects of Severe Mental Illness (SMI) on bone density (BMD). BMD of the forearm, femoral neck and body % was measured by a DXA unit (Hologic QDR 4500). 30 individuals (17 male; 13 female) with SMI (bipolar (N=14), schizophrenia (N=5), schizoaffective (N=4), major depression/depression (N=2), and other (N=5)) volunteered for the study. Total group (N=30) body fat % (37.3±8.4) and BMI (32.4±6.06) is significantly greater than national and state averages. Bipolar (N=14) showed the highest body fat % (39.1±8.1 vs. 30.7±9.4 %, p<0.05).

Introduction

Bone is a living, dynamic tissue that is the single most important supportive tissue in the human body [1]. Bone strength is determined by bone mineral density (BMD) which accounts for up to 70% of total bone strength [2]. Psychiatric disorders are associated with an increased rate of premature death [3]. While a number of recent reports have investigated the risk of obesity and metabolic syndrome in patients with Severe Mental Illness, few studies have investigated other potential serious long-term side-effects such as osteopenia or osteoporosis [4,5,6]. This study was to determine the bone mineral density (BMD) and body composition (Body Fat %) of individuals with severe mental illness.

2. Experiment, Results, Discussion, and Significance

Methods: Thirty individuals (aged 21-66) with severe mental illness 30 individuals (17 male; 13 female) with SMI (bipolar (N=14), schizophrenia (N=5), schizoaffective (N=4), major depression/depression (N=2), and other (N=5)) volunteered for the study. The participants were recruited from Breakthrough (Wichita, Kansas) and all conditions were stable (no change in medication regime for three weeks prior to enrollment). The study was approved by the Institutional Review Board. Written informed consent was obtained from each subject prior to testing. Height and weight were obtained in the Human Performance Laboratory (Wichita State University), prior to the BMD scan. Bone mineral Density and Body composition were measured by a dual energy x-ray absorptiometry (DXA) unit (Hologic QDR 4500). Standard protocol set forth by the manufacturer, for the non-dominant forearm, femoral neck, and whole body scans were followed.

Results: This study was designed to measure the bone mineral density and body composition of individuals with severe mental illness, using the DEXA. Total group (N=30) body fat % (37.3±8.4) and BMI (32.4±6.06) is significantly greater than national and state averages. By groups, bipolar (N=14) showed the highest body fat % (39.1±8.1 vs. 30.7±9.4 %, p<0.05), forearm and femoral neck t-scores were normal. Schizophrenia group (N=5), schizoaffective (N=4), major depression/depression (N=2), and other (N=5), body fat %, forearm t-score, femoral neck t-score were within normal range (results found in Table 1). Of the individuals with bipolar disorder 57% are currently taking one of the four drugs (Zyprexa, Abilify, Risperdol, Seroquel) found to cause excess weight gain in children and adolescents [7]. Those individuals with the diagnosis of schizophrenia were found to have the lowest t-scores in both their femoral necks and forearms.

Discussion: These participants have several risk factors other than medications to cause lower BMD and high BF%. Many of the individuals that were tested live lifestyles that can cause lower BMD and higher BF%. These can include but aren’t limited to smoking, excessive carbonated soft drink consumption, consumption of alcohol, and
poor diets. This study has found the same outcome of other studies [8,9], that antipsychotic drug treatment may cause long-term consequences that include bone loss.

Table 1: Results

<table>
<thead>
<tr>
<th></th>
<th>Whole Body t-score</th>
<th>Body Fat % t-score</th>
<th>Forearm t-score</th>
<th>Femoral Neck t-score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bipolar Disorder (N= 14)</td>
<td>39.1±8.1</td>
<td>-0.1±1.0</td>
<td>-0.1±0.8</td>
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<tr>
<td>Schizophrenia (N=5)</td>
<td>26.58±8.0</td>
<td>-0.6±1.43</td>
<td>-1.0±1.08</td>
<td></td>
</tr>
<tr>
<td>Schizoaffective (N=4)</td>
<td>27.33±3.8</td>
<td>-0.4±1.56</td>
<td>0.4±0.51</td>
<td></td>
</tr>
<tr>
<td>Major Depression (N=2)</td>
<td>32.8±8.13</td>
<td>0.8±0.42</td>
<td>-0.4±0.42</td>
<td>0.4±0.51</td>
</tr>
<tr>
<td>Other (N=5)</td>
<td>34.7±8.33</td>
<td>-0.7±0.91</td>
<td>-0.9±0.70</td>
<td></td>
</tr>
<tr>
<td>Total Group</td>
<td>32.4±6.06</td>
<td>37.3±8.4</td>
<td>-0.3±1.1</td>
<td>-0.4±0.8</td>
</tr>
</tbody>
</table>

Significance: The information gained in this study will be particularly beneficial to exercise professionals, medical professionals, and the participants. This is an original study that has an outcome that would be both beneficial to the general public and have a significant contribution to the scientific field. The data collected provides information that is relevant to the understanding of mental illness, the medication to control the illness, and the changes in bone density.

3. Conclusions

This pilot study adds to the limited evidence about the underserved population of severe mental illness, with results showing a decreased bone mineral density and increased body fat %. Many studies that are present are on psychiatric inpatients or on hospitalized patients. This study shows results for individuals who are living within the community with their illness. Additional research is needed to support these findings.

4. Acknowledgements

I would like to thank Breakthrough for allowing me to help their members through this study. Thank you, Ashley Fryman for the many hours that you helped me with the DXA. It made the scans go much faster and the time more manageable. I would like to thank Dr. Jeremy Patterson for allowing me to work on this project. I enjoyed it and learned so much, even though it didn’t always seem that way. And finally, thank you WSU for awarding us the ULINK grant last year, which allowed this project to happen.

5. References