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Risk for osteopenia and osteoporosis in institution-dwelling individuals with intellectual and/or developmental disabilities

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ABSTRACT

The purpose of this study was to investigate the prevalence of and contributing factors to osteopenia and osteoporosis among people with intellectual disabilities (ID) or/and developmental disabilities (DD) residing in a disability institution in Taiwan. The present study was conducted at one disability institution in Taiwan and recruited 184 institutionalized residents with ID and/or DD (115 men and 69 women aged 18–72 years) for analysis. For all residents with ID and/or DD, information was obtained about their age, gender, level of ID, BMI, and bone mineral density (BMD). BMD is a measurement of calcium levels in bones that can estimate the risk of osteoporosis and bone fractures. Bone tests were divided into three outcome categories based on their calcaneal BMD *T*-scores: Normal BMD, a *T*-score $\geqq -1$; Osteopenia, $-2.5 \leqq$ *T*-score < -1; and Osteoporosis, a *T*-score < -2.5. The results revealed that 46.2% of cases were normal and that 27.7% and 26.1% of cases had osteopenia and osteoporosis, respectively. Multiple logistic regression analyses found that male gender (OR = 2.482, 95% CI = 1.04–5.93, $p < 0.05$), age $\geqq 40$ years (OR = 3.051, 95% CI = 1.07–8.69, $p < 0.05$) and being overweight/obese (OR = 0.395, 95% CI = 0.17–0.93, $p < 0.05$) were more likely to be associated with osteoporosis. Another model indicated that males (OR = 2.169, 95% CI = 1.12–4.19, $p < 0.05$) and those aged $\geqq 40$ years (OR = 3.026, 95% CI = 1.32–7, $p < 0.01$) tended to have an increased risk for osteopenia and osteoporosis. To improve the bone quality of individuals with ID or/and DD and to decrease the occurrence of osteopenia and osteoporosis, this study highlights that we should pay much attention to the potential risk factors for bone quality in these vulnerable populations.

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1. Introduction

Osteoporosis is a condition defined as low bone density along with microarchitectural distortions of bones that predispose them to fracture (NIH, 1993; World Congress on Osteoporosis, 1996), and osteoporosis is a chronic, progressive, metabolic bone disease that can affect almost the entire skeleton (National Osteoporosis Foundation, 1998). Osteoporotic fractures are a significant cause of morbidity and mortality, particularly in developed countries (Johnell & Kanis, 2006). The fracture rate was significantly greater in developmental disability residents with osteoporosis (Lohiya, Crinella, Tan-Figueroa, Caires, & Lohiya, 1999).

Petrone (2012) reported that individuals with ID are at higher than average risk for many chronic conditions. One condition that is often overlooked or underdiagnosed is osteoporosis. A community survey found that the rate of osteoporosis among males with intellectual and/or developmental disabilities was higher than for males in the general population (Zylstra, Porter, Shapiro, & Prater, 2008). Bone mineral density (BMD), which is a surrogate measure of bone strength, is an important predictor of fracture (Schrager, 2004). Srikanth, Cassidy, Joiner, and Teeluckdharry (2011) reviewed relevant studies that demonstrated that an increased prevalence of osteoporosis and osteopenia was associated with low BMD. Center, Beange, and McElduff (1998) conducted a population study that showed that there was lower BMD in people with ID than in an age-matched reference population. In hospital patients, Aspray et al. (1998) found significant differences between adults with ID and control subjects.

Osteoporosis is more prevalent in adults with ID. Kilpinen-Loisa, Arvio, Ilvesmäki, and Mäkitie (2009) found that Vitamin D levels in adults with ID living in nursing homes tended to be low, and enhanced screening for this condition is recommended; however, evidence-based screening recommendations are lacking (Wilkinson, Culpepper, & Cerreto, 2007), particularly in Asian countries. Therefore, the purpose of this study was to investigate the prevalence of and factors contributing to osteopenia and osteoporosis among people with ID or/and developmental disabilities (DD) residing in a disability institution in Taiwan.

2. Method

The present study was conducted at one disability institution in Taiwan and recruited 184 institutionalized residents with ID and/or developmental disabilities (115 men and 69 women aged 18–72 years) for analysis. The ethics of the study were approved by the study institution. According to the Taiwan Protection Law for the Physically and Mentally Disabled (1997), ID is defined as the presence of significant intellectual retardation or incomplete mental development during the growth period. People with an ID often exist concurrently with related limitations in areas such as recognition ability and social adaptation skills. The institution-dwelling individuals with ID may have other developmental disabilities, such as autism, hearing disabilities, visual disabilities, mental disabilities, cerebral palsy or physical disabilities.

For all residents with ID, information was obtained about their age, gender, level of ID, BMI, weight, height and BMD. BMD is the measurement of calcium levels in bones and can estimate the risk of osteoporosis and bone fractures. In this study, BMD was measured with a portable DMS PEGASUS SMART Bone Densitometer, which is a portable, easy-to-use, fast and efficient solution for screening and monitoring osteoporosis. Featuring the most recent technology available on an ultrasound device, the Pegasus Smart estimates the bone strength of the heel bone, a site well correlated with the femur/hip bone (DOTmed com Inc., 2014). Three trained nurses and four public health masters' students collected BMD data in December 2013. The study participant was seated in a chair with his/her right foot rested in the machine, and the average scan time was 30 s. The results of the test were divided into three outcome categories based on their calcaneal BMD *T*-scores: Normal BMD, a *T*-score $\geqq -1$; Osteopenia, $-2.5 \leqq$ *T*-score < -1; Osteoporosis, a *T*-score < -2.5.

3. Results

3.1. Respondent characteristics and BMD distribution

Table 1 shows the demographic characteristics of the study participants. The mean age of the study subjects was 35.5 ± 10.2 years (range 18–72 years); 62.5% of the subjects were male, and 37.5% were female. In the study sample, most of the people with ID were more likely to have a serious level of disability, with severe and profound disabilities accounting for 34.8% and 26.1% of the participants, respectively. With regard to disability type, 74.5% of the study subjects had ID alone, whereas 25.5% were affected by multiple disabilities (ID accompanied by autism, hearing, physical or other disabilities). The mean BMI was 24.6 ± 5.4 (range 14.7–43.5); 45.1% of the subjects were normal, 15.2% were overweight, 31.5% were obese and 8.2% were underweight.

Fig. 1 shows that 46.2% of cases had normal (*T*-score $\geqq -1$) BMD; 27.7% cases had osteopenia ($-2.5 \leqq$ *T*-score < -1), which refers to early signs of bone loss that can develop into osteoporosis; and 26.1% of cases were identified as at-risk for osteoporosis (*T*-score < -2.5). Among the male cases, 38.3% were normal, 29.6% cases had osteopenia and 32.2% were at-risk for osteoporosis. In the female cases, 59.4% were normal, 24.6% of cases had osteopenia and 15.9% were at-risk for osteoporosis.