Central adiposity is an independent risk factor for low Vitamin D among adults with cerebral palsy.

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ABSTRACT

Background & Aim: Individuals with cerebral palsy (CP) are at increased risk for nutritional insufficiency. The purpose of the study was to examine the vitamin D status of adults with CP, and to determine the association between functional level, age, and anthropometric indicators of adiposity.

Methods: Serum vitamin D levels, body mass index (BMI), waist circumference, and functional level (measured by the Gross Motor Function Classification System (GMFCS)) were examined in 112 adults with CP. Vitamin D status was assessed by serum 25-hydroxyvitamin D level (25(OH)D) in mg/dL. The influence of motor impairment and adiposity on 25(OH)D were assessed using linear general models and logistic regression, with GMFCS as a standard categorical covariate (two categories: GMFCS I-III, and IV-V), and age, sex, BMI and WC as moderators.

Results: Mean vitamin D level was 28 ± 16.0 mg/dL. Only 27% of subjects had normal level of 25(OH)D. 29.8% were low normal, 32.4% were insufficient and 10.8% were deficient. Overweight or obesity according to BMI was prevalent (52%), as was abdominal obesity in men (23.5% at 102 cm cut-off) and women (31.1% at 88 cm cut-off). General linear modeling demonstrated a robust, independent association between the indicator of visceral adiposity (WC) and 25(OH)D level (p = 0.009), even after controlling for age, sex and GMFCS. Logistic regression revealed that according to sex-specific WC cutoffs, the odds of being deficient in vitamin D (i.e., < 20 ng/mL) was 1.5 times higher in females compared to males (p = 0.009). Moreover, according to sex-specific WC cutoffs, the odds of being deficient in vitamin D increase by a factor of 3.5 (95% CI 1.12-11.0) for abdominal obesity.

RESULTS

Characteristics of the study population are presented in Table I. GMFCS levels ranged from I-V, with the following breakdown: GMFCS I = 30%, GMFCS II = 28.9%, GMFCS III = 27% GMFCS IV = 25.9%, and GMFCS V = 0.7%. In terms of anthropometric measures, 36% (27.8%) were classified as overweight or obese (i.e., BMI ≥ 25 kg/m²), and of those, 23.5% were classified as obese (i.e., BMI ≥ 30 kg/m²) adults with GMFCS IV-V were generally smaller in stature than GMFCS I-III.

Vitamin D Level

The range for vitamin D level was from 5 to 64 ng/mL (Table I), and correlated to both para-thyroid hormone (PTH) (r = -0.24, p=0.023) and WC (r = -0.40, p=0.002). Only 30 (27.8%) subjects were considered to have optimal levels of vitamin D (>40 ng/mL), whereas 29.6% had low-normal levels (25-29 ng/mL), 27.8% had insufficient levels (10-24 ng/mL), and 20.8% were deficient (<10 ng/mL). Based on IOM recommended levels, 37 (33%) subjects were below the level necessary for bone health. There were no differences in vitamin D across GMFCS (p=0.09) (Figure 1).

DISCUSSION

The primary finding of this investigation is that adults with CP are at increased risk for nutritional insufficiency. Vitamin D deficiency was significantly associated with lower BMI, age, and male sex. Furthermore, vitamin D levels were significantly lower in males compared to females. These findings are consistent with other studies that have reported a decreased vitamin D status among CP adults. However, the present study is unique in that it also examined the relationship between vitamin D status and functional level, which is a significant limitation in previous studies.

Several demographic factors have been shown to be associated with vitamin D levels, including age, sex, and race. In this study, age and sex were significant predictors of vitamin D status. Additionally, the presence of obesity and abdominal obesity were associated with lower vitamin D levels. These findings are consistent with previous studies that have also shown a relationship between obesity and vitamin D status.

The present study also investigated the relationship between vitamin D status and functional level. The results showed that GMFCS was significantly associated with vitamin D levels, with lower levels observed in more severe GMFCS levels. This finding is consistent with previous studies that have also reported a relationship between functional level and vitamin D status.

Overall, the present study provides important insights into the relationship between vitamin D status and anthropometric and functional indicators in adults with CP. The findings highlight the need for future research to further explore the relationship between vitamin D status and functional level, and to develop strategies to improve vitamin D status among adults with CP.