

STRONG CHILDREN'S RESEARCH CENTER

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Background: Recent literature shows that patients with type 1 diabetes (T1D) have low bone density and are at increased risk for osteoporosis. The mechanism for this increased risk is unclear. Previously, we reported that poor glycemic control was associated with greater urinary calcium excretion in adolescents with T1D (Weber et al., 2016). For effects of type 1 diabetes on bone health, dietary intake is a potential modifiable risk factor. Given the necessity of adherence with T1D management, it is important to identify dietary intake patterns that are feasible for T1D aged children without T1D and to identify risk factors for low dietary calcium intake in T1D. **Methods:** A food frequency questionnaire (FFQ) adapted from the Nutrition Center, NIH Clinical Center was used to assess dietary intake in 160 participants from the First Steps Campaign at the National Institutes of Health (NIH) Clinical Center. Multivariate analysis of dietary intake data from 160 participants was tested for leverage (Hosmer/Lemeshow leverage) influence (Cooks D).

Results: The percentage of males in T1D, and NHANES populations were 53.1% and 49% respectively (p=0.05) (Table 1). The average age of T1D and NHANES participants was 13.5 and 13 years respectively (p<0.05). The unexposed siblings (US) group had an average age of 10 years, which was significantly different from the T1D group (p<0.05), and the T1D with siblings (T1DwS) group, which had an average age of 13 years (p<0.05). No difference in age existed between T1D and T1DwS groups (p>0.05). Both populations of US and T1DwS were 95% white, significantly different from the NHANES population (p<0.05) (Table 1). The NHANES group had a median dietary calcium intake of 927 mg, which was significantly lower than the T1D group, which had a median of 1574 mg (p< 0.001). A direct comparison between T1DwS and US showed no significant difference in calcium intake (112 mg vs. 1475 mg respectively (p

= 0.26). Additionally, compared to the other three groups, the NHANES population had 34% meeting the recommended daily allowance (RDA) of calcium compared to the T1D population which had 77% ($p < 0.05$). The US and T1DwS groups had 73% and 86% meeting RDA, both significantly higher than NHANES ($p < 0.05$). Within T1D participants, calcium intake was inversely associated with age ($R^2 = -0.17$, $p = 0.04$), positively associated with growth ($R^2 = 0.33$, $P < 0.001$), and not associated with average A1c ($R^2 = 0.02$, $P = 0.99$).

Conclusion: This study found that dietary calcium intake was greater in T1D and US from URM compared to a nationally representative population of NHANES. There was evidence of a trend toward increased calcium intake in a subsample of T1D participants compared to US; the small sample size of this group may have limited our ability to detect a statistical difference. This study demonstrates that despite the fracture risks, nearly ¼ of the pediatric T1D population is not achieving the RDA of calcium. It was also found that calcium intake is inversely proportional to the age of the T1D population, despite the fact that bone accrual is ongoing throughout the entire age range of the population studied. Additionally, over 75% of this population did not meet the recommended guideline of sustaining an A1c below 7.5. Consequently, these combined factors may significantly increase the fracture risk within the T1D population. The methodology for obtaining the calcium intake differed between NHANES and the present study, which may explain the differences noted. However, diet recalls have been done on a sample of the T1D study population and preliminary studies suggest a strong relationship with the FFQs. Future diet recalls are planned to confirm that the FFQ and diet recall methods may be accurately compared.