

*Abstract*

# Fracture Risk Factors among Children Living in New Zealand <sup>†</sup>

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<sup>†</sup> Presented at the 2019 Annual Meeting of the Nutrition Society of New Zealand, Napier, New Zealand, 28–29 November 2019.

Published: 13 December 2019

There are limited data available regarding relationships between bone fracture history and risk factors among New Zealand (NZ) children.

Children aged 8–12 years were recruited. Capillary blood spots collected from a finger prick were analysed for 25(OH)D concentrations. Bioelectrical impedance analysis (InBody720, Seoul, Korea) was used to measure body fat percentage (%BF). Information about fracture history, sibling fractures, family osteoporosis history, physical activity (PA), ethnicity, intake of calcium-containing foods, and sugar-sweetened beverage (SSB) consumption was collected through questionnaires.

Children ( $n = 647$ , 354 girls), mean  $\pm$  SD age  $9.8 \pm 0.7$  years were recruited from six Auckland primary schools. NZ European ( $n = 252$ ) (NZE) and South Asian ( $n = 68$ ) children reported the lowest (20.2%) and highest (44.1%) fracture incidence, respectively. NZE compared to South Asian children, had higher 25(OH)D concentrations ( $74.6 \pm 19.8$  vs.  $48.4 \pm 19.3$  nmol/L,  $p < 0.001$ ), higher total calcium intake ( $764.0 \pm 394.4$  vs.  $592.7 \pm 266.3$  mg/day,  $p < 0.018$ ), and lower %BF ( $19.5 \pm 6.6$  vs.  $23.4 \pm 8.4$ ,  $p < 0.003$ ). Māori children had the next highest fracture rate (34.2%). This group had 25(OH)D  $64.2 \pm 18.9$  nmol/L, but high %BF (23.9%) and most participated in vigorous PA. After stratifying by sex, binary logistic regression analysis revealed the main determinants of fracture history for boys were high %BF, low 25(OH)D, low calcium intake, high SSB consumption, siblings' fracture history, and being South Asian; and in girls, high SSB consumption, siblings' fracture history, and family osteoporosis history.

We found South Asian ethnicity was a significant risk factor for boys. Some children were at high risk of vitamin D deficiency and for these supplementation may be necessary in winter. Good nutrition (especially good sources of calcium) and reducing SSB intakes should be recommended to children during growth and development to reduce their risk of fractures.



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