

## Pilote study: Comparison of mineral intake between children from endemic and non-endemic areas for Kashin-Beck disease in Tibet Autonomous Region

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### Background

The Kashin-Beck disease (KBD) is an endemic and chronic osteochondropathy affecting between 0.74 million and 2.5 million people in the Tibet Autonomous Region and in several provinces of the People's Republic of China. The etiology remains unclear, although a multifactorial hypothesis has been proposed (selenium/iodine deficiency; high concentration of organic matters in drinking water; and mycotoxin poisoning by fungi infecting cereals). The rural population is almost exclusively affected.

### Objectives

The first objective of this study was to assess and to compare the mineral daily intake between Tibetan preschool children living in endemic areas for the Kashin-Beck disease and those living in non-endemic areas. A second objective was the comparison of children daily intakes with Chinese Dietary Reference Intakes (DRIs). The third objective was to estimate a sample size for a cross-sectional survey aiming to highlight significant differences in mineral intakes between the two groups of preschool children.

### Materials and Methods

Ten Tibetan preschool children were enrolled per group (endemic/non-endemic) for this pilot study. Children had to be weaned and those living in endemic area must have a KBD sibling. The nutrition survey consisted in an interactive simplified 24-hour recall questionnaire. Two 24-hour recalls were recorded for the endemic group, in February 2010 (EAW) and in May 2010 (EAs), while one day has been recorded for the non-endemic group in July 2011 (NEA). At the same time, samples of the main staple foods were collected for chemical analysis. The daily intakes of Ca, P, Mg, Fe, Zn, Cu, and Mn were calculated based on the 24-hour recall records, the chemical analyses, and data from food composition tables (FCTs).

### Results and discussion

We are aware of limitations in the methodological approach of this pilot-study. The number of children, although weak, was empirically decided for the sake of feasibility and because no prior information was available. The interactive 24-hour recalls between the two groups are spaced in time. Nevertheless, the diet of rural Tibetans is far from diversified, and the variability among seasons and years is probably low.

Daily intakes in Ca, P, Mg, Fe, Zn, Cu and Mn were calculated for children of each group. Parametric test were applied for comparison of mean daily intakes between groups. A significant difference was highlighted for Cu ( $p$ -value $<0.01$ ) and Fe ( $p$ -value $<0.05$ ), no other significant difference was detected.

When comparing individual daily intakes and Chinese DRIs, the most striking results concern Ca and Mn. The great majority of children showed severe deficiency in calcium and enormous excess in manganese.

A power ( $1-\beta$ ) of 80% is commonly accepted when estimating a sample size for a cross-sectional survey. In this case, the maximum sample size is too high and not feasible in practice (several hundred children per group). Oppositely, the power was calculated per mineral, based on 100 children per group. The power is higher than 90% for Mg, Fe, and Cu. For the others minerals, the power is well below 80%. Nevertheless, general deficiencies and excesses have been observed in the two groups for part of these minerals. We believe that it is a statement in itself and trying to highlight small differences between groups in such extremes is not relevant.