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Total Liver Vitamin A Reserves, Determined With $^{13}\text{C}_2$ -Retinol Isotope Dilution, are Similar Among Tanzanian Preschool Children in Areas With Low and High Vitamin A Exposure

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ABSTRACT

Background

In Tanzania, some districts have single vitamin A (VA) interventions and others have multiple interventions. There is limited information on total liver VA reserves (TLRs) among preschool children (PSC) in Tanzania.

Objectives

We assessed total body VA stores (TBSs) and TLRs among PSC living in 2 districts with low and high exposures to VA interventions using ^{13}C -retinol isotope dilution.

Methods

A cross-sectional, health facility-based study was conducted in 2 districts with access to VA supplementation only (low exposure to VA interventions) or multiple interventions (high

exposure to VA interventions) to determine TLRs in 120 PSC aged 36–59 months. A questionnaire was used to collect data. Height and weight were measured, and the prevalence of undernutrition was based on *z*-scores. Blood samples were collected for measurement of TBSs, TLRs, retinol, biomarkers of infection and inflammation, and hemoglobin. ¹³C₂-retinyl acetate (1.0 μmol) was administered to each child after blood collection, and the second sample was taken 14 days later. Serum was analyzed with HPLC and gas chromatography-combustion-isotope ratio mass spectrometry. Mann-Whitney U test was used to compare medians of nonnormally distributed variables. Pearson χ^2 test was used to assess associations between 2 categorical variables.

Results

Median TBSs differed between PSC from low-exposure (196 μmol; IQR, 120 μmol) and high-exposure (231 μmol; IQR, 162 μmol) intervention areas ($P = 0.015$). Median TLRs were 0.23 μmol/g liver (IQR, 0.14 μmol/g liver) and 0.26 μmol/g liver (IQR, 0.16 μmol/g liver) from low- and high-exposure areas, respectively, which did not significantly differ ($P = 0.12$). Prevalences of VA deficiency (VAD; < 0.1 μmol/g liver) were 6.3% and 1.7% for PSC from low- and high-exposure areas, respectively. There was no significant difference in VAD ($P = 0.25$). No child had hypervitaminosis A (> 1.0 μmol/g liver).

Conclusions

TLRs in Tanzanian PSC from 2 districts did not differ between low and high exposures to VA interventions. The majority had adequate VA stores. VAD in the study area presented a mild public health problem.

Keywords:

hypervitaminosis A, low exposure high exposures table isotopes vitamin A deficiency