Validation of a food group based nutrition software to assess nutrient intake in Tanzania

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Background: Analysis of food intake by 24 h recalls or food frequency questionnaires are the common methods to quantify nutrient intake in larger surveys. After data acquisition, data analysis is time consuming and individual results can not be provided to the participants directly after the interview. These limitations can be overcome by the nutrition software CIMI (Calculator of inadequate micronutrient intake), which calculates nutrient intake using food groups automatically and directly after data input. Feedback to the respondent enhances willingness to participate in such surveys and provision of reliable answers. In addition, face-to-face feedback can help to improve nutritional quality directly.

The present study verifies the accuracy of the CIMI program by comparing the results with the established nutrition software NUTRISURVEY.

Methods: 24 h dietary recalls of 1013 Tanzanian women from Kilosa and Chamwino districts collected in the Trans-SEC project (347 women, January to May 2015) and the Scale-N study (666 women, July to August 2016) were analyzed by two different methods: (1) Nutrient calculation with the nutrition software NUTRISURVEY (NS), based on single food items and (2) the program CIMI, which analyses nutrient intake by 24 different food/beverages groups. These groups reflect an average nutrient composition of foods that are typical for the Tanzanian eating pattern. Macro- and micronutrient intake calculation of NS and CIMI were compared using SPSS 24.

Results: Differences in nutrient intake between CIMI and NS were marginal: out of the 14 analyzed macro- and micronutrients, mean difference +/- standard deviation were for energy +65kcal +/- 283, protein -1.4g +/- 15.5, retinol equivalents -170µg, vitamin B1 +0.15mg +/- 0.33, iron +1.5mg +/- 10.7, and zinc -1.2mg +/-2.6. Nutrients with a very high accuracy (difference expressed as % of NS result: +/-<5%) were energy, protein, carbohydrates, vitamin B2 and B6. Those with a good accuracy (+/-5-15%) were vitamin B1 and C, iron and zinc. Moderate accuracy (+/-15-30%) showed retinol equivalents, vitamin B12, folic acid and calcium. Fat was the only nutrient which was not calculated adequately by CIMI.

Discussion: The food group based approach of CIMI is suitable to identify persons with low energy, protein or micronutrient intake. Time for data input is less compared to 24h recall methods analyzing single food items. Although calculation of fat intake by CIMI was lower compared to Nutrisurvey, computation of energy intake which is more relevant in nutrition analysis, showed high conformity. Vitamin C calculation was prone to a lower accuracy, due to high variability of vitamin C content of foods within the food groups regarding fruits and vegetables. But critical discrepancies have only been observed in a some cases in ranges above the recommended nutrient intake. The objective of CIMI to identify persons with low nutrient intake is not affected by this limitation.

Conclusion: CIMI is a valid and timesaving instrument to measure nutrient intake in Tanzania. A soon available CIMI-app will also consider mineral bioavailability, fulfillment of recommendations and adjustment of food groups by the respondent. This will lead to an improved, user-friendly handling with even more accurate results.