

The Use of Anthropometrics, BMI and Isotope Dilution Techniques in assessing Double Burden Malnutrition in Children (3-5 years) in the Northern and Southern part of Botswana

INTRODUCTION: Under-nutrition and over-nutrition have adverse effects of health and are both associated with negative human developments. In Botswana data is limited on the prevalence of these conditions; more-over the existing data is at best equivocal. There is also evidence of high stunting rates in children under five years of age. Therefore, there is a critical need to explore assessment tools and techniques that are reliable. The aim of this study was to assess the prevalence of under and over-nutrition using three different assessment techniques.

METHODS: This was a descriptive cross sectional survey conducted on 197 children under five years of age who were attending growth monitoring as a standard component of paediatric services. Convenience sampling was used to enrol children who met the inclusion criteria of the study. Weight and height were measured using calibrated instruments and data was entered into the World Health Organization Anthro software to calculate z scores. Stunting was defined as $<-2SD$ for height for age and overweight as $>+2SD$ for weight for height. BMI was also calculated and the CDC gender and age specific growth charts were used to classify the children. Below 5th percentile was considered as underweight and greater than 85th percentile as overweight. Finally, for the deuterium (D2O) dilution technique which is used to assess body fat mass percentage, DBM was defined as fat mass percentage $< 13%$ for boys and $< 23%$ for girls (low fat mass) and $> 20%$ for boys and $>30%$ for girls (high body fat) as under- and overnutrition respectively. Results are presented as mean \pm standard deviations (SD), ranges for continuous data and percentages for categorical data. ANOVA was run to compare group means of particular methods. Results were significant at $p<0.05$.

RESULTS: The prevalence of undernourished and over-nourished were 12.2% and 2.5% respectively using z scores classification whilst using the BMI method, 11.2% were undernourished whereas 53.8% were over-nourished. When using Deuterium(D2O) dilution technique, 46.7% were found to be undernourished and 14.7% were over-nourished. Further analysis showed a statistical difference in the methods of assessment towards under-nutrition as shown by one-way ANOVA ($F(2, 134) = 367.1, (p < 0.00001)$). Similarly, with over-nutrition there was a statistical significance in the measurement of over-nutrition using the three methods as shown by one-way ANOVA ($F(2,136) = 299.7, (p < 0.00001)$).

CONCLUSION: Despite the differences in the prevalence rates by the three methods all revealed the co-existence of under and over nutrition. It is evident that the burden of underweight and overweight are a problem in children in Botswana, hence government should intensify efforts in putting in place effective strategic programmes and address the gaps in the current programmes with a view of promoting the health of children in Botswana. More extensive research with a representative sample is required to further validate these findings.

Keywords: Double burden malnutrition, Under-fives, Isotope dilution technique, Anthropometrics, BMI

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