GENOTYPE EFFECTS OF B-CAROTENE CONVERSION TO VITAMIN A: IMPLICATIONS ON REDUCING VITAMIN A DEFICIENCY IN THE PHILIPPINES

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BACKGROUND

Vitamin A is required for normal organogenesis, immune competence, tissue differentiation, and the regeneration of the visual cycle. Worldwide, vitamin A deficiency (VAD) is estimated to be 190 million in pre-school-age children. In the Philippines, VAD prevalence among 6-12 years old children is 11.1% which is considered as a public health problem of moderate severity.

The requirements for vitamin A can be met either from intake of animal foods containing preformed vitamin A or from plant foods containing provitamin A such as carotenoids. The key enzyme responsible for carotenoid conversion into the active form of vitamin A is β-carotene 15,15'-monooxygenase (BCMO1). However, it has been reported that the conversion efficiency of carotenoid into vitamin A is highly variable in different individuals as well as among population groups due to genetic variants in the BCMO1 gene.

OBJECTIVES

The study determined the BCMO1 single nucleotide polymorphism (SNP) frequency among 6-18 year old Filipino children, particularly rs7501331 and rs12934922.

MATERIALS AND METHODS

Extracted DNA samples from respondents of the 8th NNS were analyzed and genotyped for BCMO1 rs7501331 and rs12934922 using the 96-well CFX96™ RT PCR Detection System. A total of 555 selected amplicons of BCMO1 SNPs rs7501331 were submitted for direct sequencing and genotype analysis for rs12934922 among 723 respondents was performed using the High Resolution Melt SNP analysis following Biorad™ Precision Melt Supermix.

RESULTS

Results showed that 56.0%, 37.86% and 6.31% of CC, CT and TT for rs 7501331 genotype were found among Filipino children, while 80.36%, 19.50% and 0.14% genotype frequencies of AA, AT and TT were obtained for rs 12934922. Results of the genotype frequency of both SNP targets follow the Hardy-Weinberg Equilibrium at p-value > 0.05, indicating good data quality.

CONCLUSION AND RECOMMENDATION

The results suggest that a portion of the Filipino children (43.96% for rs7501331 and 19.6% for rs12934922) carries the risk genotype that decrease a person’s ability to convert β-carotene into vitamin A. Pre-determination of the proportion of the population who are at risk for VAD by genetic profiling is an important step in prioritizing those that needs intervention either by increasing intake of β-carotene or preformed vitamin A supplements. Adaption of recommended dietary intake of carotenoids, or doses of carotenoids incorporated in functional foods/supplements, to population groups with genetic variants that affect carotenoid status is also forward.