Thesis Title Zinc and Copper Status in Thalassemic Children

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ABSTRACT

The study was conducted to investigate zinc and copper status and their relationship to protein-energy status in 47 Thalassemic children and 10 healthy children. The patients consisted of 11 children with Hb H disease, 26 children with β-thalassemia/Hb E and 10 children with β-thalassemia major. Protein-energy status was determined by anthropometric, dietary and biochemical assessment, zinc status by plasma, erythrocyte and urinary zinc levels, copper status by plasma copper level and erythrocyte superoxide dismutase (SOD) activity. All of these thalassemic children had significantly lower plasma and erythrocyte zinc levels while urinary zinc, plasma copper, plasma copper:zinc ratio and erythrocyte SOD activity were higher than normal subjects. The rises in plasma copper level and plasma copper:zinc ratio in thalassemic children

are consistent with zinc deficiency whereas the high erythrocyte SOD activity can be due to the increased amount of superoxide radical in red blood cells and the increased plasma copper level. Zinc deficiency in the thalassemic children caused by hyperzincuria which was most likely due to the release of zinc from hemolyzed red cells. This is supported by the significant negative correlation between urinary zinc and erythrocyte zinc levels ($r=-0.70$, $P<0.001$) as well as the increased indirect bilirubin levels. Children with β-thalassemia major had the highest mean ($\pm$SEM) urinary zinc and the lowest erythrocyte zinc levels. Splenectomy and blood transfusion did not affect zinc and copper status in thalassemic children. Protein-energy malnutrition (PEM) in thalassemic children was marasmic type. The prevalence of PEM based on weight for age, height for age, MAC for age, and AMC for age were 74.5, 72.3, 75.6 and 82.9%, respectively. The causes of inadequate protein-energy status in thalassemic children are multiple. Three factors are identified in our study, i.e., low energy intake (44% of RDA), chronic hypoxia which is evidenced by the significant positive correlations between Hb levels and the following parameters: weight for age, height for age, AMC for age, and MAC for age, and zinc deficiency which is evidenced by the significantly positive correlations between plasma zinc and height for age, AMC for age, and MAC for age as well as the significantly negative correlations between plasma

copper:zinc ratio and weight for age, height for age, AMC for age and MAC for age.