

NUTRITIONAL STATUS AND SERUM ZINC CONCENTRATION WITH CHILDREN AGED 0-36 MONTHS VISITED FOR NUTRITION COUNSELLING THE DR. NUTRI NUTRITION CLINICS, 2023-2024

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ABSTRACT

Objective: To evaluate the nutritional status and serum zinc concentration and some related factors of children 0-36 months.

Methods: Cross-sectional description based on medical records of 245 children.

Results: The rate of malnutrition wasting was 5.3%, stunting was 17.5% and underweight was 8.6%, notably the rate of overweight and obesity was 9.4% and there was a statistically significant difference between the 2 age groups with $p < 0.05$ and OR (CI 95%) 0.3 (0.12-0.76). The rate of zinc deficiency was up to 51.4% and there was a statistically significant difference between the 2 age groups with $p < 0.05$ and OR (CI 95%) 1.9 (1.17-3.26) and the average serum zinc concentration had a statistically significant difference between the 2 age groups with $p < 0.05$. Children with malnutrition wasting and overweight /obesity have a significantly higher risk of zinc deficiency and there is a statistically significant difference with $p < 0.05$.

Conclusion: The rate of malnutrition and zinc deficiency is still high in children aged 0-36 months, especially stunting, overweight and obesity.

Keywords: Nutritional status, serum zinc, children.

1. INTRODUCTION

In 2022, according to the World Health Organization, 148.1 million children under 5 years of age were stunted, 45.0 million were wasted, and 37.0 million were overweight and obese [1]. The double burden of disease affects global health, coexisting with malnutrition and overweight- obese [2]. Zinc is an important micronutrient for good health, and zinc deficiency is one of the most common forms of micronutrient malnutrition globally, with an estimated 17% of people worldwide at risk of zinc deficiency, and 19% and 24% in Asia and Africa, respectively [3,4]. Zinc deficiency is associated with malnutrition, impaired immunity, and cognitive impairment in children [5,6]. In Vietnam, according to the 2019-2020 national nutrition survey, the rate of stunting malnutrition in children under 5 years old nationwide is 19.6%, underweight malnutrition in children under 5 years old is 11.5%. Zinc deficiency in children under 5 years old is up to 58.0% [7]. Every year, Dr.Nutri clinic receives thousands of children for

examination, some of whom are found to be malnourished and zinc deficient. To determine the current status of malnutrition, zinc deficiency and provide nutritional counseling, contributing to improving the malnutrition situation in children, the group conducted a study: Assessment of nutritional status and serum zinc concentration in children 0-36 months old who came for examination and nutritional counseling at Dr.Nutri nutrition clinic in 2023-2024

2. SUBJECTS AND METHODS

2.1. Subjects, location and time of study:

- Subjects: Children aged 0-36 months, guardians agree to participate in the study.

- Exclusion Subjects: Congenital malformations, physical defects affecting anthropometric

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measurements, children using zinc and zinc-containing products in supplementary or therapeutic form within 3 months before the examination.

- Location and time of study: at Dr. Nutri Nutrition Clinic, Hanoi from October 2023 to April 2024.

2.2. Study design: Cross-sectional descriptive observation.

2.3. Study sample size and sampling method:

The study selected all children who met the study's inclusion and exclusion criteria. The convenience sampling method was applied. During the study period, we selected 245 children for the study.

2.4. Data collection: Using a checklist to extract research data from medical records. Including demographic information of children, anthropometric measurements and serum zinc test results.

2.5. Some criteria for identification and assessment: Zinc deficiency is determined when the blood zinc concentration (morning) is $<10.1 \mu\text{mol/L}$ (ie $<66 \mu\text{g/dL}$). Underweight malnutrition when WAZ score $<-2\text{SD}$, stunting malnutrition when HAZ score $<-2\text{SD}$, wasting malnutrition when WHZ $<-2\text{SD}$, overweight and obesity when WHZ $>+2\text{SD}$ (WHO 2006) [1].

2.6. Data analysis and processing: Data are entered and analyzed on SPSS 20 software. Nutritional status is assessed on WHO Anthro 3.2 software. Statistical tests are used χ^2 -test, Fisher Exact-test, T-test with statistical significance level of $p < 0.05$.

2.7. Research ethics: The research does not cause harm to patients, research participants and guardians are carefully explained and have the guardian's consent to participate. Patient information is kept confidential.

3. RESULTS

Table 1. Nutritional status of children by age group

Nutritional status	Total (n=245)	Age group		p OR (CI95%)
		0-23 months (n=138)	24-36 months (n=107)	
Marasmus	13 (5.3)	9 (69.2)	4 (30.8)	p ^a >0.05
Not malnourished	232 (94.7)	129 (55.6)	103 (44.4)	
Stunting	43 (17.5)	21 (48.8)	22 (51.2)	p ^a >0.05
Not malnourished	202 (82.5)	117 (57.9)	85 (42.1)	

Nutritional status	Total (n=245)	Age group		p OR (CI95%)
		0-23 months (n=138)	24-36 months (n=107)	
Underweight	21 (8.6)	13 (61.9)	8 (38.1)	p ^a >0.05
Not malnourished	224 (91.4)	125 (55.8)	99 (44.2)	
Overweight-obese	23 (9.4)	7 (30.4)	16 (69.6)	p ^a <0.05 0.3 (0.12-0.76)
Not Overweight-obese	222 (90.6)	131 (59.0)	91 (41.0)	

^a χ^2 -test

The rate of wasting malnutrition was 5.3%, stunting malnutrition was 17.5% and underweight malnutrition was 8.6%, notably the rate of TCBP was 9.4% and there was a statistically significant difference between the 2 age groups with $p < 0.05$ and OR (CI 95%) 0.3 (0.12-0.76).

Table 2. Zinc deficiency status and serum zinc concentration by age group

Index	Total (n=245)	Age group		p
		0-23 months (n=138)	24-36 months (n=107)	
Zinc deficiency	126 (51.4)	81 (64.3)	45 (35.7)	p ^a <0.05
Zinc adequate	119 (48.6)	57 (47.9)	62 (52.1)	1.9 (1.17-3.26)
* Zinc concentration ($\mu\text{mol/L}$)	922±1.67	8.80±1.23	9.86±1.43	p ^a <0.05

^a χ^2 -test, ^b T-test

The rate of zinc deficiency was up to 51.4% and there was a statistically significant difference between the 2 age groups with $p < 0.05$ and OR (CI 95%) 1.9 (1.17-3.26) and the mean serum zinc concentration had a statistically significant difference between the 2 age groups with $p < 0.05$.

Table 3. Association between nutritional status and zinc deficiency

Nutritional status	Total (n=245)	Zinc status		p OR (CI 95%)
		Zinc deficiency (n=126)	Zinc adequate (n=119)	
Marasmus	13 (5.3)	9 (69.2)	4 (30.8)	p ^a >0.05
Not mal-nourished	232 (94.7)	117 (50.4)	115 (49.6)	
Stunting	43 (17.5)	32 (74.4)	11 (25.6)	p ^a <0.05 3.3 (1.6-6.9)
Not mal-nourished	202 (82.5)	94 (46.5)	108 (53.5)	
Underweight	21 (8.6)	15 (71.4)	6 (28.6)	p ^a >0.05
Not mal-nourished	224 (91.4)	111 (49.5)	113 (50.5)	
Overweight-obese	23 (9.4)	18 (78.3)	5 (21.7)	p ^a <0.05 3.8 (1.4-10.6)
Not Overweight-obese	222 (90.6)	108 (48.6)	114 (51.4)	

^a χ^2 -test

Children with stunting and overweight- obese have a significantly higher risk of zinc deficiency and there is a statistically significant difference with $p < 0.05$

4. DISCUSSION

The study subjects were divided into 2 age groups: 0-23 months (during the 1000 golden days) and 24-36 months. According to the 2019-2020 national nutrition survey, the rate of stunting was highest in the age group of 18-23 months 25.4%, the age group of 24-29 months 23.4% and the age group of 30-35 months 21.4% and the rate of stunting in children under 5 years old nationwide was 19.6% and underweight was 11.5% [7]. In this study, the rate of stunting malnutrition was 17.5%, underweight was 8.6%. The rates of malnutrition in our study were lower than the national rate. The reason may be that the location and the subjects of patients coming to the clinic were mainly Hanoi and neighboring provinces where the socio-economic conditions are relatively developed nationwide. In this study, the rate of overweight- obese had a statistically significant difference in the 2 age groups of 0-23 months and 24-36 months with $p < 0.05$ and OR (CI 95%) 0.3 (0.12-0.76), showing that the older the age, the higher the rate of overweight- obese. According to a study on children aged 6-23 months at the clinic and nutrition consultation, Institute of Preventive Medicine and Public Health (2023), the rate of marasmus was 9.4%, stunting was 13.2% and underweight was 11.2%, overweight was 5.1% and obesity was 0.8% [8]. The rate of malnutrition in this

study was lower than in our study, possibly due to the difference in study age, 6-23 months and 0-36 months. But the common point is that it is lower than the rate of malnutrition nationwide. The rate of zinc deficiency according to the 2019-2020 national nutrition survey in children under 5 years old was 58% [7]. In this study, the rate of zinc deficiency was 51.4%, lower than the national average. The average serum zinc concentration of $9.22 \pm 1.67 \mu\text{mol/L}$ was statistically significantly different between the two age groups with $p < 0.05$ and OR (CI 95%) 1.9 (1.17-3.26) and the average serum zinc concentration was statistically significantly different between the two age groups with $p < 0.05$. The age group 0-23 months was at higher risk of zinc deficiency than the age group 24-36 months. It may be due to the lack of diversity in the diet of children 0-23 months old, lack of zinc-rich foods such as seafood and nuts, lower resistance, higher risk of infection, causing more zinc loss and deficiency. A study at the National Children's Hospital (2022) showed that the rate of zinc deficiency in children from 6 months to under 5 years old was 28.6% and the deficiency in the following age groups was; the age group of 6-11 months was 26.4%, the age group of 12-23 months was 11.3%, and the age group of 24-35 months was 29.3% [9]. The rate of zinc deficiency in this study was half lower than in our study. Each association between nutritional status and zinc deficiency showed that children with stunting and overweight- obese were at significantly higher risk of zinc deficiency than other malnutrition with a statistically significant difference with $p < 0.05$ and OR (CI 95%) were 3.3 (1.6-6.9) and 3.8 (1.4-10.6), respectively. This suggests that either stunting and overweight- obese may cause zinc deficiency or that zinc deficiency may influence stunting and overweight- obese further research is needed to prove this hypothesis. It is possible that poor zinc diets and increased requirements lead to zinc deficiency in this population.

5. CONCLUSION

The rate of malnutrition is still high among children aged 0-36 months, especially stunting malnutrition, the rate of overweight- obese increases with age, creating a double burden of diseases due to undernutrition and overnutrition. The rate of zinc deficiency in this age group is also very high, especially among children with malnutrition and stunting and overweight- obese. More research is needed to find a solution to supplement zinc in food to limit zinc deficiency in children.

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