

7th NATIONAL NUTRITION SURVEY, PHILIPPINES 2008: SERUM ZINC LEVELS IN SELECTED FILIPINO POPULATION GROUPS

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ABSTRACT

Background: Zinc is an essential nutrient for humans and deficiency in this nutrient is an important and widespread risk to human health. According to World Health Organization (WHO), zinc deficiency ranks 5th among the 10 leading causes of illness and disease in developing countries. To date, zinc status data based on serum zinc levels are still very limited. Most recently, the first zinc status assessment study by serum zinc level conducted by the Food and Nutrition Research Institute, in collaboration with the World Health Organization (WHO), reported that zinc deficiency was generally of high magnitude (>20%) among preschool children (6mo - 5y), female adolescents (13–19y), older persons (20-<60y) and pregnant women. These findings suggest that zinc deficiency among other Filipino population groups may likewise be of public health significance. **Objective:** This paper aimed to determine serum zinc level and magnitude of zinc deficiency among Filipino school-aged children (6-12 y), male adolescents (13-19y), male and female adults (20-<60y) and lactating women from the sampled households in the 7th National Nutrition Survey (NNS). **Methods:** Serum zinc levels was determined by atomic absorption spectrometry (AAS) and prevalence and magnitude of zinc deficiency was evaluated using the suggested lower cut-offs and guidelines for public health concern, respectively of the International Zinc Nutrition Consultative Group (ZiNCG). SPSS and STATA were used to compute the mean, SE and the prevalence and 95% confidence interval indicative of zinc deficiency. **Results:** Zinc deficiency was noted in 30.8% of school-aged children, 32.2% in male adolescents, 31.0% in adults and 39.7% in lactating women with mean serum zinc levels of 79.9 ± 0.8 , 79.9 ± 0.8 , 84.2 ± 0.6 and 72.7 ± 1.1 $\mu\text{g/dL}$, respectively. Among school children, male generally showed higher risk to zinc deficiency than female, both in the overall prevalence and by single age group. Overall prevalence of zinc deficiency among adults was slightly higher in females than males (31.2 % vs 30.2%), however, disaggregation by age group showed females had higher prevalence rate than males in the 20-29y and 30-39y-old group after which, male were noted more at-risk especially in the 50-59y-old group. Mean serum zinc levels and prevalence of zinc deficiency increased and decreased with stage of lactation, respectively; the lowest mean serum zinc level and highest prevalence rate was observed



among lactating women in the 1st 6 months of lactation. **Conclusions:** Based on IZiNCG's suggested guidelines for public health concern, zinc deficiency among these selected population groups was of high magnitude (>20%). Lactating women were the most at-risk group to zinc deficiency. **Recommendations:** Considering that zinc deficiency is of significant public health concern, epidemiologic studies that will identify high risk factors influencing the development of zinc deficiency should be undertaken, generated data of which will be vital in designing an effective population-wide intervention strategy to improve zinc nutriture of Filipino population groups. Reassessment of zinc status should be periodically done to monitor status changes over time. Specifically, as inadequate intake is a major factor in the development of zinc deficiency, it is important that determination of zinc values in local Filipino foods, as well as inhibitors affecting zinc absorption like phytates be established.

INTRODUCTION

Zinc is an essential nutrient for humans. It is involved in the synthesis and degradation of carbohydrates, proteins and nucleic acid and is required for growth and bone development. Given the diverse array of biologic functions zinc performs, zinc deficiency is an important and widespread risk to human health. According to WHO, zinc deficiency ranks 5th among the 10 leading causes of illness and disease in developing countries. Growth retardation, diarrhea, increased susceptibility to infection and impaired reproduction were among the well-documented consequences of zinc deficiency.

Serum or plasma zinc has been recognized as the most systematic and best available biomarker to assess the zinc status in population. However, zinc status data by serum zinc levels are still very limited. Most estimates of zinc deficiency were based on suggestive indicators of zinc deficiency, as recommended by IZiNCG: absorbable zinc content of the national food supply, rates of stunting of under-five children, and high rates of iron deficiency anemia (IDA).

Most recently, in the first zinc status assessment study by serum zinc level, of national estimate conducted by the Food and Nutrition Research Institute in collaboration with the World Health Organization, zinc status was reported generally of high magnitude (>20%) among infants and preschool children (6 mo – 5 y), female adolescents (13–19y), older persons (20 - <60y) and pregnant women. These findings suggest that the extent of risk to zinc deficiency among other population groups may likewise be of public health significance. In addition, rates of stunting in both 5-10 y-old (25.6%) and 10.0-19.0 y-old children (26.9%) remained public health problems in the 7th NNS. Anemia prevalence was generally of moderate magnitude (10.0 - 39.0%) from 1993-2008 NNS in most population groups. Further, 70% of a typical Filipino foods consumed was from



plant origin and rice and corn, which are the main staples contain high phytate that potentially inhibit zinc absorption. Moreover, the per capita intake/day of meat and fish and their products was only 9.6% and 12.8%, respectively, which are the best sources of bioavailable zinc.

This study aimed to determine serum zinc levels and prevalence and magnitude of deficiency among selected population groups in the 7th NNS: school children, 6-12 y; male adolescents, 13-19 y; male and female adults, 20 -<60 y and lactating women.

This will serve as a baseline data on zinc status of selected Filipino population groups which will be relevant input for program planners/policy makers in designing/ formulating effective intervention strategies to improve zinc nutriture of Filipinos. This will also be a significant contribution in the data base of WHO and IZiNCG in assessing the global prevalence of zinc deficiency.

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OBJECTIVES

- To determine serum zinc levels and prevalence and magnitude of zinc deficiency among selected Filipino population groups.

METHODS

STUDY DESIGN

- Cross sectional
- Multi-stage sampling design utilized 1 of the 4 replicates of the 2008 1st quarter Labor Force Survey (LFS) developed by National Statistics Office (NSO)

PARTICIPANTS

Selected population/physiologic groups in the 7th NNS

- School children, 6-12 yrs, M&F (3789)
- Adolescents, 13-19 yrs, M (1208)
- Adults, 20 <60 y, M & F (5797)
- Lactating women (836)



BIOCHEMICAL ANALYSIS

Blood collection

- Time of collection: morning only
- In the fasting state among adults



Blood collected by venous method

Processing of samples



Separation of serum from red blood cell was done within 2 hrs after collection

Storage samples



In the field and during transport:
Freezer/liquid nitrogen tank/
Ice chest w/ wet/dry ice

Trace
element-
free tube



Centrifuge



At FNRI laboratory: 80°C freezer until analyzed

Serum Zinc Analysis

- determined by Atomic Absorption Spectrometry (AAS)
(Smith et al, 1979/
Butrimovitz & Purdy)

Quality Assurance Program:

Accuracy

- assessed using 2 Standard Reference Materials
- NIST SRM 1598a
- Seronorm trace elements serum (Level 1)

Precision

- monitored by determining zinc concentration of internal quality control pooled serum analyzed with other samples



Atomic Absorption Spectrometry (AAS)



DATA ANALYSIS

Statistical analysis: by SPSS/STATA

- Means and standard errors (SE) of the mean
- Proportion and 95% confidence interval (CI) of participants indicative of zinc deficiency
- Coefficient of variation (CV)

Note: All results presented are weighted

Prevalence and magnitude of zinc deficiency were evaluated using the suggested IZINCG lower cut-offs and guidelines for public health concern, respectively.

ASSESSMENT CRITERIA

Suggested lower cut-offs for the assessment of serum zinc concentrations in population¹

Age/ sex/ physiologic group	Zn, µg/dL		
	AM Fasting	AM Other	PM
Children, <10 yrs	not available	65	57
Females, ≥ 10 yrs			
Non-pregnant	70	66	59
Pregnant			
1 st trimester	56	56	56
2 nd & 3 rd trimester	50	50	50
Males, ≥ 10 yrs	74	70	61

¹ Hotz & Brown, 2004

Suggested guidelines for public health concern¹

Magnitude	% Prevalence
Low	< 5
Moderate	5 - < 10
Moderately High	10 - 20
High	> 20

¹ Hotz & Brown, 2004

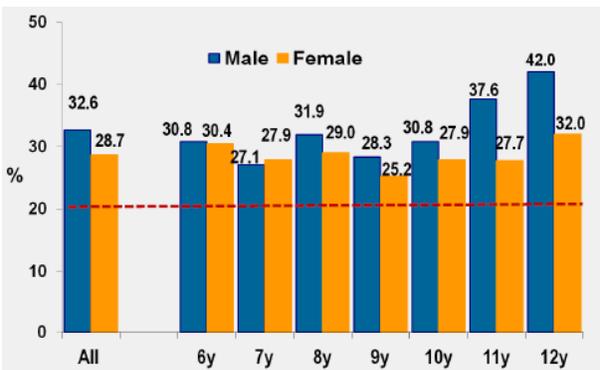
RESULTS

Mean serum zinc levels (± SE) and prevalence of zinc deficiency by age, sex and physiologic groups



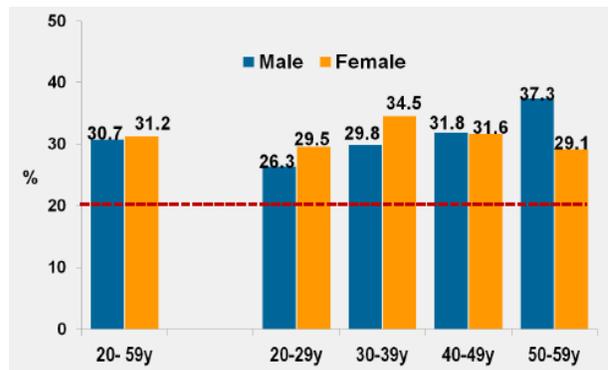
This slide shows the mean serum zinc levels and prevalence of zinc deficiency among selected Filipino population groups. Prevalence of zinc deficiency among these population groups was all of high magnitude (prevalence rate >20%), as shown by the broken red line. Highest prevalence was noted among lactating women (39.7%). Prevalence rates and mean serum zinc levels were observed to decline and increase, respectively with stage of lactation, with those in 1st 6 months of lactation presenting the greatest risk (45.6%).





Prevalence of zinc deficiency among school-aged children by sex/age group

Zinc deficiency was generally of high magnitude (>20%) among school children, as shown by broken red line. By single age group, males predominantly presented higher risk to zinc deficiency than females, as was also observed in the over-all prevalence (32.6 vs 28.7%). The highest prevalence was observed in the 12 y-old males (42.0%), while the lowest was seen in the 9 y-old females.



Prevalence of zinc deficiency among adults by sex/age group

Zinc deficiency was almost comparable between adult males and females (30.7% vs 31.2%) in the overall prevalence by sex. Disaggregation by age group showed that females had higher prevalence rate than males in the 20-29y and 30-39y-old groups, after which, prevalence rates were higher in males than females, the difference remarkably greater in the 50-59 y-old group.

CONCLUSIONS

- Based on IZiNCG's suggested guidelines for public health concern, zinc status among these selected population groups was of high magnitude (>20%).
- Lactating women were the most at-risk group to zinc deficiency.

RECOMMENDATIONS

- Considering that zinc deficiency are of significant public health concern, epidemiologic studies that will identify high risk factors influencing the development of zinc deficiency should be undertaken, generated data of which will be vital in designing an effective population-wide intervention strategy to improve zinc nutriture of Filipino population groups.
- Reassessment of zinc status should be periodically done to monitor status changes over time
- Specifically, as inadequate intake is a major cause of zinc deficiency, it is important that determination of zinc values in local Filipino foods, as well as inhibitors affecting zinc absorption like phytates be established.

