
بسم الله الرحمن الرحيم

Reference values for serum zinc concentration and prevalence of zinc deficiency in adult Iranian subjects

Asghar Ghasemi*, Saleh Zahediasl, Firoozeh Hosseini-Esfahani, Fereidoun Azizi

Endocrine and Obesity Research Center, Research Institute for Endocrine Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran

*: Assistant professor in Physiology

Zinc

- Is an essential trace element
- Has a wide range of biological roles in:
  - Enzyme activity
  - Gene regulation
  - Insulin synthesis and release
  - Cardiovascular homeostasis
- The majority of total body zinc (≈ 2-3 grams in adults) is stored in the skeletal muscle and bone

- Serum and Dietary zinc
- Only 0.1% of total body zinc being present in plasma
- Concentration of plasma zinc is tightly regulated
- Currently serum/plasma zinc concentration is the most widely used biochemical indicator of zinc status, particularly in a large population
- Dietary zinc intake provides information on the dietary patterns associated with zinc adequacy or inadequacy

Zinc deficiency

- The prevalence of zinc deficiency is estimated to be 20-40% worldwide
- Individual countries should be able to draw inferences regarding their relative likelihood of having public health problems of zinc deficiency
- Zinc deficiency may cause a wide variety of pathological disorders including
  - Atherosclerosis
  - Insulin resistance
  - Skin disorders
  - Delayed wound healing
  - Increased incidence of bacterial infections

Zinc Reference Values

- Appropriate reference values are useful for interpretation and clinical management of zinc disorders
- Reference values vary for different populations and should be established regionally

Aims

- Studies investigating serum zinc levels in a general population have not been conducted hitherto in Iran
- The aim of this study was to:
  - Determine the reference values for serum zinc concentrations
  - Address the prevalence of zinc deficiency

Subjects and Methods

- This study was conducted within the framework of the Tehran Lipid and Glucose Study (TLGS)

- TLGS: A prospective study performed on a representative sample of residents of district 13 Tehran

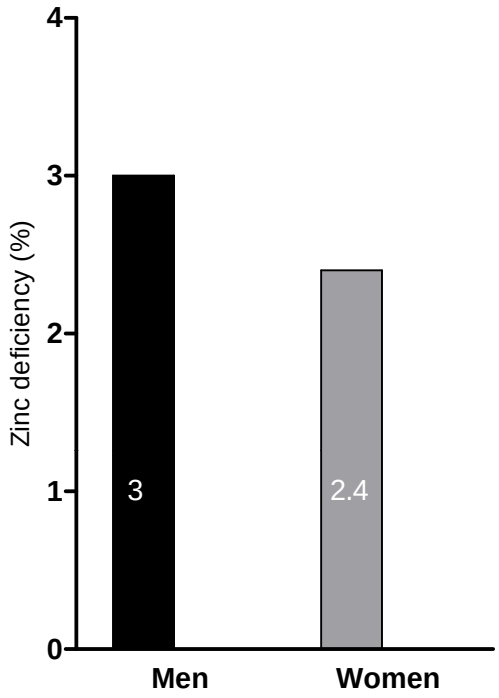
- Study participants
  - n = 4698→→→→→→→ Determining prevalence of zinc deficiency
  - Age: 20 to 90 years
  - Smokers (smoked ≥ 1 cigarette per day or using waterpipe)
  - Diabetic subjects
  - Pregnant and lactating women
  - Those with cancer, and diarrhea
  - Those using any medications including contraceptives
  - Subjects who had been hospitalized during the past 3 months
- n =2632 →→→→→→→ Determining zinc reference values

- Serum zinc measurement
  - Flame atomic absorption spectrometry
- *Dietary assessment*
  - Validated semi-quantitative food frequency questionnaire (FFQ), including 168 food items
- *Determining serum zinc reference values*
  - The International Federation of Clinical chemistry (IFCC) guidelines (non-parametric method)

Results

Table1. Serum zinc reference values		
Group	μg/dL	μmol/L
Men	62.9- 206.5	9.6-31.6
Women	58.2- 195.5	8.9-29.9
Total	60.8- 201.4	9.3-30.8

Table 2. Reference intervals for serum zinc concentration (μmol/l) according to age and gender			
	Age (years)	n	95% Reference intervals
Men			
	20-29	286	10.3-32.8
	30-39	246	9.6-31.7
	40-49	269	9.6-32.1
	50-59	154	8.9-30.9
	≥ 60	164	7.8-30.6
	All	1119	9.6-31.6
Women			
	20-29	375	9.1-29.2
	30-39	391	9.6-30.2
	40-49	370	8.9-31.3
	50-59	231	8.4-31.4
	≥ 60	146	8.3-29.5
	All	1513	8.9-29.9


Zinc deficiency (%)
4
3
2
1
0
3
2.4
Men
Women

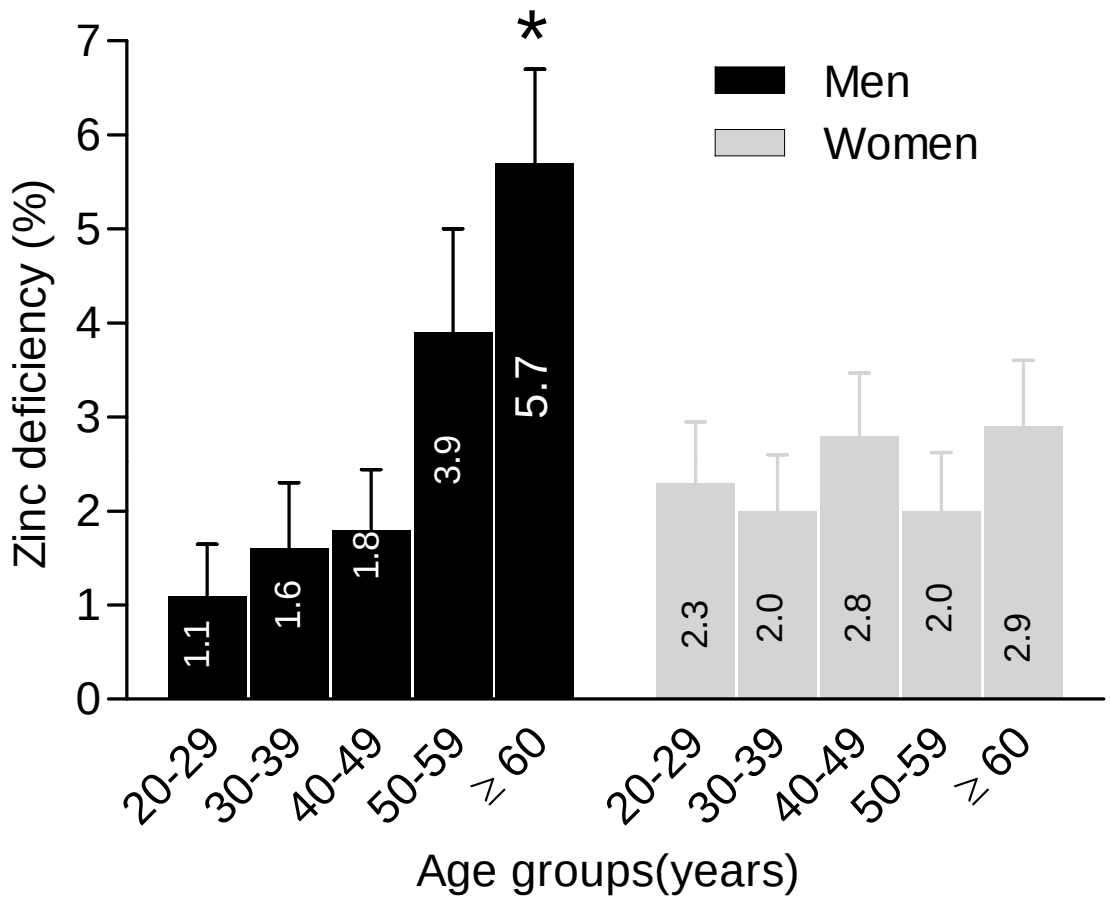

Zinc deficiency (%)
7
6
5
4
3
2
1
0
*
Men
Women
1.1
1.6
1.8
3.9
5.7
2.3
2.0
2.8
2.0
2.9
20-29
30-39
40-49
50-59
≥ 60
20-29
30-39
40-49
50-59
≥ 60
Age groups(years)

Figure 1.

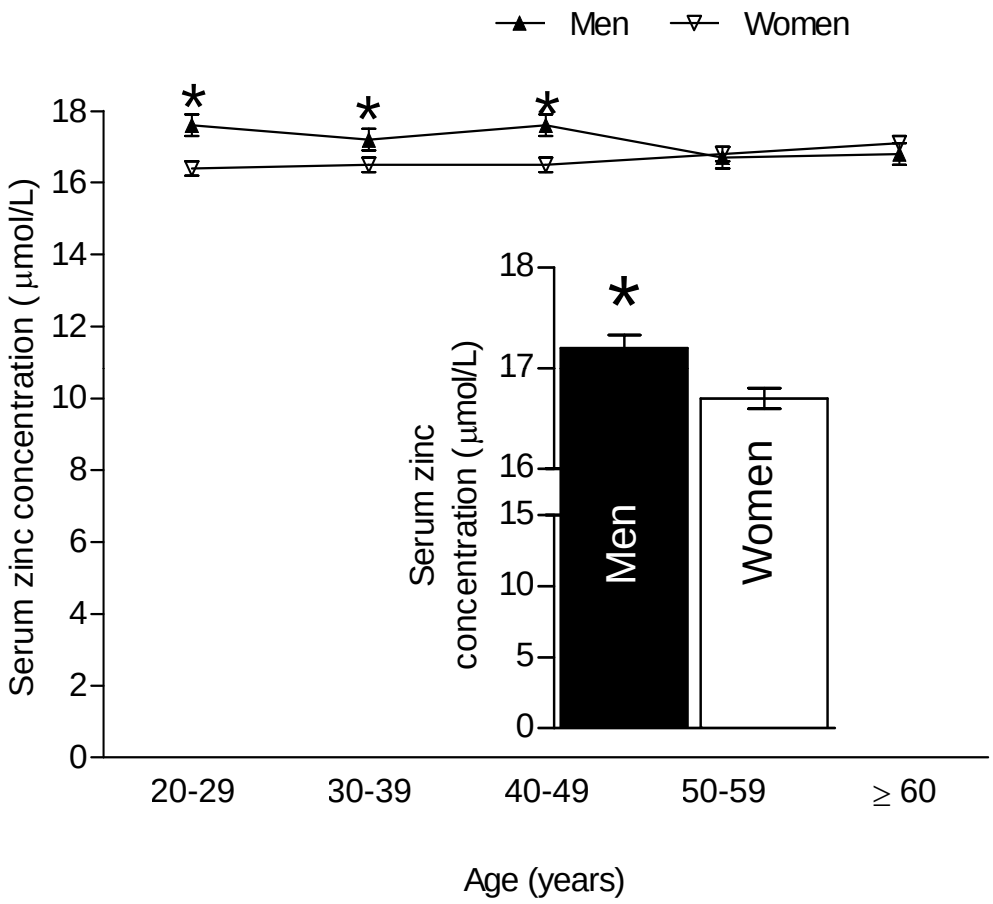

Men
Women
Serum zinc concentration (μmol/L)
18
16
14
12
10
8
6
4
2
0
20-29
30-39
40-49
50-59
≥ 60
Age (years)
Serum zinc concentration (μmol/L)
18
17
16
15
10
5
0
Men
Women

Figure 2.

Table 3. Food groups by mean ± SD percentage contribution to zinc intake (mg/day)

Food groups		Contribution to zinc intake			
		Total population (n=2906)		Healthy individuals (n=1685)	
		Men (n=1233)	Women (n=1673)	Men (n=730)	Women (n=955)
Dairy	①	22.1 ± 10.0 *	24.3 ± 11.0	21.8 ± 10 *	23.6 ± 11.0
Whole grains	②	21.7 ± 14.0*	17.0 ± 14.0	21.4 ± 14.0 *	16.6 ± 13.0
Refined grains	②	16.0 ± 9.0 *	14.4 ± 8.0	16.7 ± 9.0 *	15.0 ± 9.0
Meats	③	12.4 ± 7.0	12.6 ± 7.0	12.6 ± 7.0	12.9 ± 7.0
Vegetables		5.6 ± 3.0 *	7.1 ± 4.0	5.4 ± 3.0*	6.9 ± 4.0
Potato		0.5 ± 0.6	0.5 ± 0.7	0.6 ± 0.6	0.6 ± 0.7
Fruits		3.6 ± 3.0 *	4.3 ± 4.0	3.5 ± 3.0*	4.3 ± 4.0
legumes		4.3 ± 3.0	4.5 ± 4.0	4.2 ± 3.0	4.5 ± 4.0
Nuts		4.0 ± 5.0	4.0 ± 6.0	3.9 ± 4.0	3.8 ± 5.0
Others		0.9 ± 0.9	1.0 ± 1.0	0.9 ± 0.9	1.1 ± 1.0

- The mean ± SD of zinc intake:
  - Men: 15.8 ± 11.0 mg/day
  - Women: 14.7 ± 11.0 mg/day
- Dietary zinc inadequacy (<9.4 mg/day in men and 6.8 mg/day in women):
  - Total participants: 10.3% (6.5% men and 3.8% women, $p < 0.01$)
- No significant correlation was found between dietary zinc intake or zinc density of diet and serum zinc concentrations

Conclusions

- The reference ranges for serum zinc levels were different in men (9.6-31.6 μmol/L) and women (8.9-29.9 μmol/L)
- Prevalence of zinc deficiency was 3.0% and 2.4% in men and women respectively
- Prevalence of serum zinc deficiency and dietary zinc inadequacy seems to be lower in Iranians, compared to some other countries


Thanks for your attention