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# Nutritional Zinc Status of Free-Living Elderly Farmers in Abanla Village, Oyo State, Nigeria

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**Abstract:** ***One hundred and twenty elderly farmers aged 60-100 years living in Abanla village of Idi-Ayunre Local Government area of Oyo State, Nigeria, were assessed for dietary and urinary Zinc excretion. Dietary zinc intakes were measured from meals consumed over a two day period. The dietary zinc intake of the elderly male and female farmers was similar(P>0.05).The mean daily zinc intake of 12.46+/-1.45mg for males and 11.82+/-2.61mg for females appeared marginally adequate compared to the recommended dietary allowance (RDA). The respondents may be deficient in zinc because there was lack of or low intake of rich sources of zinc such as beef, egg, and oyster. The diet of the elderly people were also predominantly of plant origin. However, the urinary zinc excretion was within acceptable ranges. The males excreted significantly more (P<0.05) urinary zinc than the females (3.01+/-2.21g/8 hours and 2.00 +/-1.40 g/8 hours respectively). No correlation existed between age and urinary zinc excretion (r=0.029, n=90). Nutrition education should be promoted throughout life especially during adolescent period when food habits are being formed. Regular medical check-up should also be encouraged so that early detection and correction of infirmities would reduce age onset or pathological conditions.***

**Keywords:** Nutrition, Zinc status, Elderly, Farmers, free-living

## 1. Introduction

The term "Elderly" is not a very clear term, should it be reckoned biologically or chronologically? In the United Kingdom, it is arbitrarily applied to persons of pensionable age (women of 60+ years and men of 65+ years). Sometimes it is divided into "young old" and "old old", but this categorization may be influenced by the life expectancy in different societies.

Aging is a complex process involving biological, psychological, social spiritual, as well environmental component. Biological changes, which are progressive, detrimental and cumulative in effect, constitute the basis of aging, and in turn modify psychological and social functioning. With increasing age, there is a change from growth and evolution towards atrophy and involution, although the rate varies due to the interplay of heredity and environment [14]. Aging is associated with alterations in the immune system, effects which may be exacerbated by inadequate zinc (Zn) status [12].

Peculiar changes have been associated with age advancement such as changes in metabolism. The appetite or lack of it in the elderly may lead to primary malnutrition. Todhunter [21] concluded that what and how an individual eats determines how fast he ages and what disease of old age are likely to set in.

Zinc was recognized as a dietary essential for rats in 1934; it was in 1961 that evidence of symptoms of zinc deficiency was established. These symptoms include retarded growth, delayed sexual maturity and delayed healing of wounds. These symptoms can be reversed by adding zinc to the diet. Prasad et al, 1982, reported that zinc plays an essential role in biochemical functions, such as metabolism and synthesis of nucleic acid, proteins and mucopolysaccharides of the skin and subcutaneous tissues. It also has biological important interactions with hormones and plays a role in production, storage and secretion of individual hormones [10].

The adult human body contains approximately 2.5g of zinc, with the highest concentration found in the eyes, muscle, liver and kidney [2]. Plasma concentrations range from 80 – 110 per 100ml [4]. The concentration is constant with no significant variation attributed to sex, food consumption, diurnal variation [9].

The richest source of zinc is oyster, beef and other red meats, eggs, hard cheese, milk, yoghurts, legumes, nuts and whole grain cereals. However white bread, fats and sugar are sources of zinc [5]. Zinc from animal sources appears to be better absorbed than that from plant [15].

Zinc appears to play an essential role in all major metabolic pathways and its deficiency results in the onset of anorexia, growth retardation, sensitivity to nitrogen intake, raised blood pressure, decreased protein synthesis and reduced RNA/DNA ratios [6].

Dietary fibre and pytate are perhaps the most important component of food that impairs zinc absorption, but other constituents also affect zinc homeostasis. They include polyunsaturated fats [8] and total nitrogen [20].

Zinc is excreted in mainly through faeces [18], and sweat. Approximately, 10mg per day is lost depending on the amount consumed. Various forms of injury increase amount of zinc lost in the urine depending on the severity and nature of the injury. High level of protein in the diet has also been shown to increase urinary zinc excretion [1].
The elderly may be at risk of zinc deficiency, and zinc metabolism may play a major role in aging process [15]. Zinc absorption decreases by a small but significant fraction with aging. This coupled with lower zinc intake may make the elderly susceptible to zinc deficiency. Symptoms of mild zinc deficiency have been observed in

some elderly subjects and the symptoms were modified on zinc implementation. Mild to moderate zinc deficiency is common in several developing countries because commonly consumed staple foods have low zinc contents and are rich in phytates which inhibit the absorption and utilization of zinc [7]. The trace element zinc is essential for the immune system, and zinc deficiency affects multiple aspects of innate and adaptive immunity [11].

In a developing country like Nigeria, it is not easy for majority of elderly people to maintain an adequate nutritional status, especially in times of national food shortages. In developed countries, nutritional deficiencies occur due to changes in economic circumstances and way of life or because of age associated diseases, confusion or disabilities, which affect dietary intake, absorption and metabolism of nutrients [3]. In some rich, developed countries over-nutrition is as much of a problem as under-nutrition. Losing weight in an old age is difficult, coupled with a drop in metabolic rate and a decline in physical activities.

Increase in general population has been accompanied by large number of persons in the older age groups, this could be accredited improved medical and living standards leading to increased longevity [22]. The general objective is to assess the zinc status of the elderly by determining the level of zinc in the food consumed as well as the concentration excreted in the urine. Specific objectives are:

- To determine the dietary and urinary levels of zinc of the free-living elderly farmers.
- To analyze some foods in their ready-to-eat forms to determine the zinc content.
- To suggest necessary improvements in diets to prevent or reduce incidence of disease and promote health.

## 2. Methodology

This is an analytical prospective study. The study area was Abanla village in Idi-Ayunre Local Government Area of Oyo State. This location was purposely chosen because it consisted of large number of elderly farmers. A total of 120 respondents were randomly selected for the study, comprised of 70 women and 50 men whose ages range between 60-100 years. Nutritional status of the respondents was assessed by personal interview with them. Mass of the meals consumed over a 2-day period was taken and the average was determined. Samples of foods eaten were also collected, dried and ashed for zinc determination. Urine samples were collected overnight (8-hour urine sample) from some of the respondents (59 women and 31 men). Volume of each sample was measured, stored in freezer and later analyzed for zinc excretion.

## 3. Results & Discussion

### 3.1 Results

Table1 describes the personal characteristics of farmers. The mean age was approximately 73 years. Farmers are of accepted weight for height ratio (BMI), which did not show any evidence of energy imbalance.

**Table 1:** Description of sample population

| Variables | male n = 50 Mean +/- SD | female n = 70 Mean +/- SD | TOTAL n = 120 Mean +/- SD |
|---|---|---|---|
| age (years) | 74.2 +/- 11.8 | 71.7 +/- 11.8 | 72.7 +/- 11.8 |
| mass (kg) | 61.13 +/- 8.36 | 61.65 +/- 8.54 | 61.44 +/- 8.45 |
| height (m) | 1.71 +/- 0.12 | 1.68 +/- 0.11 | 1.70 +/- 0.12 |
| BMI (kg/m$^2$) | 20.93 +/- 5.83 | 21.89 +/- 5.96 | 21.26 +/- 5.89 |

Table 2 reveals that beef (2.61mg/100g dry weight), akara (2.51 mg/100g dry weight), moinmoin (2.23 mg/100g dry weight), stewed beans (1.62 mg/100g dry weight) and fish (1.41 mg/100g dry weight) were the richest source of dietary zinc among the list of foods eaten for two days. Ewedu soup (0.56 mg/100g dry weight) was the poorest source of dietary zinc.

**Table 2:** Zinc content of foods consumed over two-day period by free-living elderly farmers

| food description | % moisture content | zinc content (mg/100g dry weight) |
|---|---|---|
| 1. yam flower | 76 | 0.95 |
| 2. white rice/meat stew | 72 | 0.74 |
| 3. eko/agidi/pap | 88 | 1.17 |
| 4. white bread | 15 | 0.82 |
| 5. beef | 60 | 2.61 |
| 6. stewed beans | 70 | 1.62 |
| 7. vegetable egusi soup | 77 | 1.88 |
| 8. akara | 46 | 2.51 |
| 9. moinmoin | 66 | 2.23 |
| 10. eba | 76 | 0.72 |
| 11. ewedu soup | 86 | 0.56 |
| 12. boiled yam | 61 | 0.83 |
| 13. fish | 56 | 1.41 |

Table 3 describes the mean daily zinc intake from each food group. This table reveals that the elderly farmers consumed the highest amount of zinc from roots and tubers (mean = 2.79) in form of amala, eba and yam. Lowest amount of zinc was consumed through animal products and fruit/vegetables (mean = 0.85).

**Table 3:** Mean daily zinc intake of food groups

| food groups | N | male n = 50 mean +/- SD | female n = 70 mean +/- SD | Total (Placeholder1) n = 120 MEAN+/- SD |
|---|---|---|---|---|
| Cereals | 3 | 1.87 +/- 0.67 | 1.72 +/- 0.77 | 1.76 +/- 0.76 |
| Legumes | 3 | 1.71 +/- 0.13 | 1.79 +/- 0.28 | 1.74 +/- 0.19 |
| fruit/vegetables | 2 | 0.96 +/- 0.34 | 0.78 +/- 0.22 | 0.85 +/- 0.29 |
| roots & tubers | 3 | 3.02 +/- 0.39 | 2.56 +/- 0.38 | 2.79 +/- 0.38 |
| animal products | 2 | 0.87 +/- 0.19 | 0.79 +/- 0.26 | 0.85 +/- 0.36 |

N = Total food items in each food group

The dietary zinc intake of the elderly male and female subjects was similar (Table 4). The mean daily zinc intake of 12.46 +/- 1.45 mg for males and 11.82 +/- 2.61mg for females appeared marginally adequate compared to the recommended dietary allowance (RDA).

**Table 4:** Mean daily zinc intake of the elderly in relation to recommended dietary allowance (RDA)

| nutrient intake | male n = 50 mean +/- SD | female n = 70 mean +/- SD | TOTAL n = 120 mean +/- SD |
|---|---|---|---|
| zinc intake (mg) | 12.46 +/- 1.45 | 11.82 +/- 2.61 | 12.16 +/- 2.03 |
| range (mg) | 9.8 - 15 | 9.1 – 15.4 | 9.1 – 15.4 |
| % RDA met | 83% RDA | 81 % RDA | 82% RDA |
| range (RDA) | 65 – 100% | 61 – 102% | 61 – 102% |

Table 5 reveals that the urinary zinc excretion was within acceptable ranges. The males excreted more urinary zinc than the females, 3.01 +/- 2.21 g/8hrs and 2.00 +/- 1.40 g/8hrs respectively.

**Table 5:** Urinary zinc excretion

| variables | male n = 31 mean +/- SD | female n = 59 mean +/- SD | TOTAL n = 90 mean +/- SD |
|---|---|---|---|
| urine volume (ml) | 635.32 +/- 395.49 | 510.84 +/- 265.22 | 573.08 +/- 330.36 |
| range (ml) | 100 - 1470 | 150 - 1365 | 100 – 1470 |
| zinc excretion (µg/8hrs) | 3.01 +/- 2.21 | 2.00 +/- 1.40 | 2.50 +/- 1.80 |
| range (µg/8hrs) | 0.31 -10.88 | 0.46 – 6.44 | 0.31 – 10.88 |
| zinc excretion (pap) | 0.47 +/- 0.19 | 0.40 +/ 0.17 | 0.44 +/- 0.18 |
| range | 0.31 – 1.11 | 0.12 – 1.11 | 0.12 – 1.11 |

There is no significant difference in dietary zinc intake between the elderly male and female farmers. Ho is accepted since $Z_{cal} = 1.73$ and $Z_{0.05} = 1.96$.

Furthermore there is statistically significant difference in urinary zinc excretion between elderly male and female farmers.

Ho rejected since $Z_{cal} = 2.30$ and $Z_{0.05} = 1.96$.

### 3.2 Discussion

The data obtained from this study showed inadequate dietary zinc intake due to the fact that a large number of the elderly male and female subjects consumed a lot of foods of plant origin which are deficient in zinc. This could be connected to some of the following reasons:

1) Poverty due to low source of income from farming profession.
2) Physical factors such as ill state of health.
3) Physiological factors such as malabsorption of nutrients, impaired utilization of nutrients and indigestion of food due to decreased function of the gastro-intestinal tract (GIT) in old age. Moderate Zn supplementation at the level of 15 mg/d may help to maintain the T helper/CTL ratio and consequently enhance adaptive immunity [12].

There is sufficient evidence to suggest that zinc deficiency is common in many low-income countries. For example, animal foods that are particularly rich sources of zinc are not easily accessible to many of the world's poorer population. Diets based on cereals and legumes and poor in animal products make it difficult to meet the zinc requirements because their high phytate content reduces the bioavailability of zinc. Evidence for widespread zinc deficiency in developing countries also results from intervention trials in children, which showed that zinc supplementation improved growth among stunted children. Although, other nutritional and environmental factors can also cause stunting, an elevated prevalence of this condition is considered as suggestive evidence of zinc deficiency in a population [19].

## 4. Conclusion

Adequate nutrition in combination with adequate health care will increase disease-free life time, improve the quality of life and delay the emergence of specific disease. The federal government should incorporate nutrition service into health care facilities for the elderly. This policy should call for the assessment nutrition status as an integral part of the physical examination for all elderly people. Such assessment should include biomedical analysis of micro-nutrients like zinc, iron, vitamins and so on.

To alleviate poverty, which is one of the factors affecting nutritional status, the aged should be encouraged to save and invest in business while they are still actively employed. This will improve their economic stability and ultimately their dietary intake. Governments at National, State and Local levels should increase agricultural subvention to help these smallholder farmers in their agricultural enterprises.

Nutritional education at an early age at elementary school, in the mass media, will make people to take informed decisions about their diet.

The aged should be granted better retirement benefits and free medical services. Supplementary feeding programme should also be instituted in each local government area on weekly on fortnightly basis. It should a forum where the elderly meet and treated to special diets and group discussions. These will make them feel accepted and also improve their nutritional status.

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**Mr. Abiola Akintunde** has many years of experience in teaching, mostly at high school level and is now involved in full time lecturing at the university. He is an agricultural Extension Specialist who is passionate about technology and innovation transfer. He has currently submitted his PhD thesis for examination.

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