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Research Article

# Ruling out of Zinc Paucity in Different Parameters: Physical Activity, Life Stages, Family Systems, Socio-Economic Status and Blood Groups of Volunteers

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## Abstract

Zn plays a vital role in normal functioning of human physiological processes, alongside other trace elements such as Fe, I, F, Cu, Cr, Se and Mn etc. Deficiency of Zn results in alopecia, feebleness, diarrhea, hypogonadism in males, delayed sexual growth and lesions in eyes and skin. It may also cause loss in weight, changes in sense of taste and cognition, reduced appetite and slow healing of wounds. This study was done to evaluate the association of people with Zn deficiency to other parameters that were physical activity status, educational and socioeconomic background, life stage, family history and blood group. So 100 volunteers were chosen from Comprehensive Model High School Sargodha and University of Sargodha, Sargodha. Design of study was cross sectional. To assess nutritional health status of subjects demographics, vital signs, body composition, family history, medical history, anthropometrics, energetics, biomarkers and clinical signs and symptoms were used. For data interpretation R (3.2.1) software was used. According to clinical signs and symptoms Zn deficiency was greater in young adults whereas according to blood serum tests it was higher in adolescents of age 13 to 17years. Subjects having highest Zn deficiency percentage were postgraduates according to clinical signs and symptoms, and matric qualified according to blood serum tests. After statistical analysis it was concluded that Zn deficient subjects belonged to joint family system. According to blood group Zn deficiency was higher in A positive with respect to blood serum test and higher in O positive with respect to clinical signs and symptoms.

**Keywords:** Zinc; Zinc Deficiency; Physical Activity; Life Stages; Blood Group; Family System

## Introduction

Health is the condition of a living body with optimum metabolic or physiological ability. A human is considered to be in sound health or is called healthy when his/her overall mind's and body's state is without any ailment, pain or impairment [1]. Zn performs a vital role in human's wellbeing and sound health amongst other trace elements (e.g. I, Fe, Cu, Se, Mb, Cr, F and Mn etc). It is most abundant element in nucleus, cytosol, vesicles and other cell organelles [2].

Zn amount is also rich in our liver, kidneys, bones, brain and muscles and is abundant in eyes and prostate cells [3]. Zn aids in various body functions such as reproduction (sexual and asexual both), growth, sight, immunity, taster recognition, and cognitive tasks. It plays a significant part in healing of wounds [4], immunity [5], DNA replication and translation, and division of cell [6]. Zn also shows antioxidant [7] and antimicrobial properties [8]. Micronutrient deficiency is one of the serious dietetic challenge being faced by adolescents and 60 to 80 percent of the adolescents may suffer from micronutrient deficiencies [9]. Deficiency of Zn results in alopecia, hypogonadism in males, weakness, diarrhea, delayed sexual growth, and lesions on eyes and skin. It may cause decreased appetite, weight-loss, altered sense of taste recognition and cognition, and slow wound healing [10]. Also chances of infection and diarrhea increase that contributes to the mortality of 80,000 children globally every year [11]. Improper oral intake, malabsorption, increased requirement, increased loss and improper utilization are the five major reasons that cause Zn deficiency [12,13].

## Methodology

This study was carried out in the Institute of Food Science and Nutrition Sargodha, Sargodha. Comprehensive Model High School, Sargodha and University of Sargodha, Sargodha. Proper permission was taken from concerned authorities.

Boys were the target population for the study. The cross sectional study design was adopted for research work in order to estimate the prevalence of Zn deficiency, to examine the possible causes, to establish relationship between the factors causing risk and health outcomes or long time exposure to assumed factors over years in spite of weeks or months.

- **Variables:** Demographics**,** anthropometrics, blood tests, and Zn deficiency (physiological status) were dependent variables, whereas lifestyle pattern and family background were confounding variables.
- **Sample Size:** During first stage 100 volunteers were selected studying at Comprehensive Model High School, Sargodha and University of Sargodha, Sargodha and 20 subjects who had Zn deficiency symptoms were selected for further research during second stage.
- **Research Instruments**: Research instruments for this research study were body composition machine, anthropometric measurements, measuring tape, digital thermometer, laboratory investigations Blood pressure apparatus and Flame Atomic Absorption Spectrometry (FAAS).
- **Data Collection Tools: A** questionnaire was designed to collect demographic and anthropometric data, clinical, family and medical history as the sources of data collection.
- **Nutritional Health Status Assessment:** Health status of the subjects was assessed to investigate their health status in relation to nutrition as given below;
- **Demographics, Anthropometric Measurements and Energy Calculations:** The demographics parameters such as name, age, gender, socioeconomic status, education, ethnicity, and income and contact details were recorded. Questions were asked from each subject to assess physical activity.
    - The anthropometric measurements like height was measured by stadiometer in cm and weight was measured through Burer Germany (BG-64) in Kgs. Body mass index (BMI), ideal body weight (IBW), lean body weight (LBW), and body surface area (BSA) were also calculated by using special software (Mosteller, 1987). Data obtained was then compared with the standard values in order to evaluate the nutritional and health status of the subjects.
    - Moreover, body composition of the volunteers *i.e*. weight (Kg), body fat (%), body water (%), muscle mass (%), bone mass (Kg) and AMR (Kilocalories) was measured through Bio-Electrical Impedance based scale; BG-64 (Burer, Germany).
- **Energetics:** Active metabolic rate (AMR) and Basal metabolic rate (BMR) were determined through specified formulas to assess Dietary Intake correlation with health status of the subjects.
- **Vital Signs:** The vital signs of subjects such as body temperature (°F), blood pressure and pulse rate were recorded.
- **Clinical Sign and Symptoms:** Viral infection (flue), sensitivity of eye to light, loss of hair color, texture and color of nails, skin texture and infection, muscular degradation, texture of lip, loss of taste and smell, acne were the clinical sign and symptoms of Zn deficiency [10].
- **Medical and Family History:** Subjects' Medical and family histories were explored. So a questionnaire was designed to find out any disease related to Zn deficiency present in the family of subjects.
- **Investigations of Indicative Biomarkers:** Data about biomarkers like Zn level, Hemoglobin (Hb) test, and Blood Glucose were investigated at Department of Pharmacy, university of Sargodha, Sargodha and laboratories of Sargodha city.

## Results and Discussion

This study was conducted to investigate the nutritional health status with Zn deficiency and its correlation with diet in boys. To assess nutritional health status vital signs, demographics, anthropometrics, family and medical history and FFQ (food frequency questionnaire) were included in this cross sectional study. Results of the present study are discussed below:

### Physical activity and physiological status of volunteers

The relation between physical activity and physiological status of volunteers was found to be non-significant. According to clinical signs and symptoms Zn deficiency was more frequent in less active subjects whereas it was more frequent in slightly active subjects ac-

cording to blood serum test results. Less active or moderate active people had slightly more weight that can lead to Zn deficiency [20].

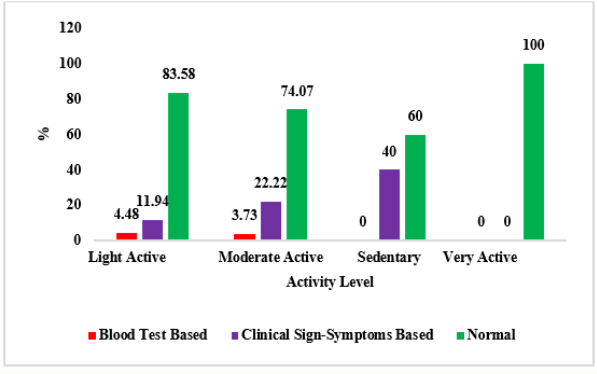


**Figure 1:** Physical activity and physiological status of volunteers.

## Life stages and physiological status of volunteers

Life stage group and physiological status of volunteers showed a non-significant relationship. So after data interpretation, Zn deficiency was more frequent in young adults according to clinical signs and symptoms, whereas it was more frequent in adolescents aged 13 to 17 years according to blood serum tests. This is also observed by De la Cruz-Góngora., *et al*. [18] who found that Zn deficiency was 28.4 % prevalent in adolescents. As rate of growth speeds up at the age of puberty and Zn is vitally required for cell division; intake of Zn is less than required by body so this may cause Zn deficiency.

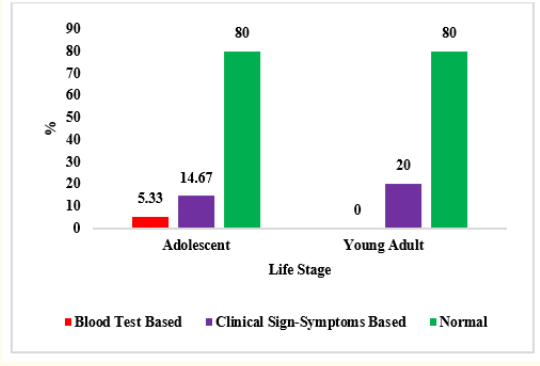


**Figure 2:** Life Stages and Physiological Status of Volunteers.

## Education and physiological status of volunteers

Relation between education and physiological status of volunteers was found to be non-significant according to this research. Subjects having highest Zn deficiency percentage that is 22.2% were postgraduates according to clinical signs and symptoms and 5.78% were matric qualified according to blood serum tests. This variation can be due to increased consumption of junk and fast foods by young adults, leading to lower Zn intake than required by body for growth [18].

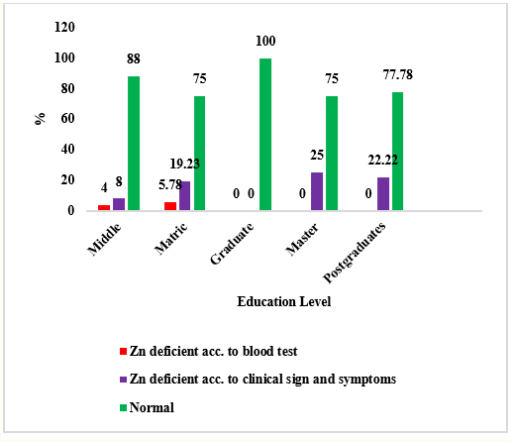


**Figure 3:** Education and Physiological Status of Volunteers.

## Family system and physiological status of volunteers

It was concluded that 6.25% of the Zn deficient group belonged to joint family system according to blood serum tests, and 18.25% belonged to nuclear family system according to clinical signs and symptoms. So this may be because of higher consumption of unhealthy diet and other domestic facilities. Several domestic problems like crowded households, family disputes, lack of hygiene, may cause various ailments according to a research done by Kaushik., *et al*. [19].

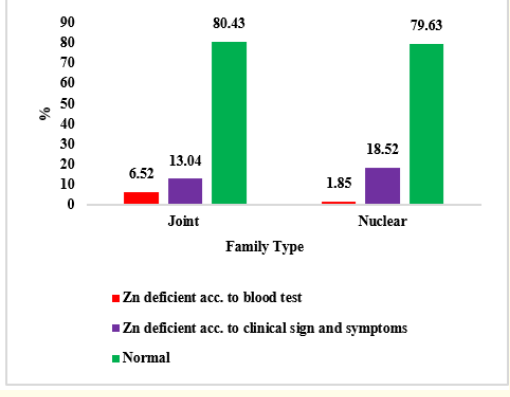


**Figure 4:** Family System and Physiological Status of Volunteers.

## Socioeconomic status and physiological status of volunteers

According to statistical analysis high frequent relationship was found between socioeconomic status and physiological status of the volunteers. According to blood serum test Zn deficient subjects were from poor families and 20.63% of the subjects were from middle class families according to clinical signs and symptoms. Poverty result in less availability of certain micronutrient enriched foods, restricted food choices as well as no awareness regarding importance of eating foods from different food groups needed for proper growth of their children. For those availably of 3time is of prime importance [21-23].

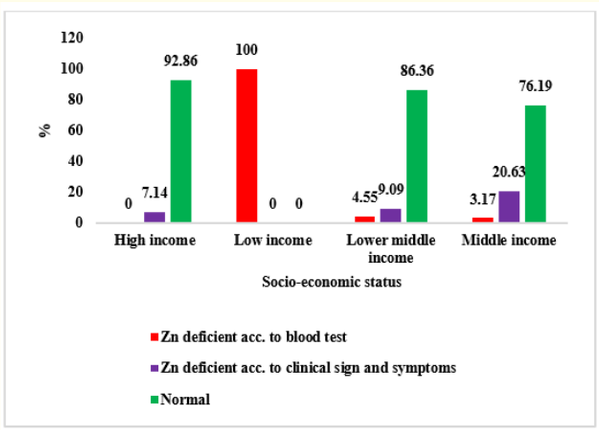


**Figure 5:** Socioeconomic Status and Physiological Status of Volunteers.

## Blood group and physiological status of volunteers

According to blood serum test Zn deficiency was highest in A+ve group. In A+ve group HCL is produced in less amount so enzyme secretion increases that are Zn dependent causing deficiency of Zn. According to clinical signs and symptoms Zn was more deficient in O+ve blood group. This is because greater requirement of protein in O+ve group and less intake of protein based foods may cause Z deficiency.

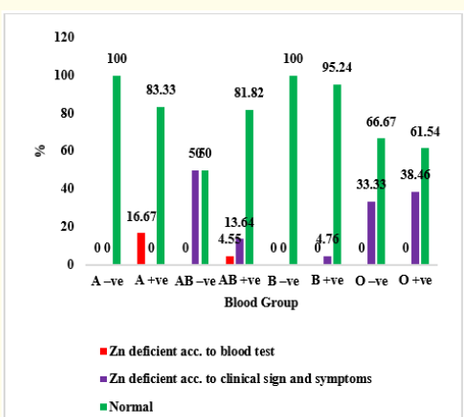


**Figure 6:** Blood group and Physiological Status of Volunteers.

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## Conflict of Interest

No financial interest or any conflict of interest exists.

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