Vitamin D and Micronutrients (Zinc and Magnesium) status in Young Females

Vineet Vishnoi[1], Aman Tadiyal[2], D.K. Awasthi[3], Gyanendra Awasthi*[2]
[1]*Department of Chemistry, DAV (PG) College, Dehradun*
[2]*Department of Biochemistry, DIBNS, Dehradun*
[3]*Department of Chemistry, JNMPG College, Lucknow*

Abstract: Vitamin D is a micronutrient that is needed for optimal health throughout the whole life. VitaminD3 can be either synthesized in the human skin upon exposure to the UV light of the sun, or it is obtained from the diet and Micronutrients (Zinc, Magnesium) essential for metabolism that catalyzes large number of reactions, facilitates protein folding, helps in manage chronic disease, keep bones strong.

Vitamin D was estimated by ELISA and Znic and Magnesium by colorimetric methods.

It was observed that the status of Vitamin D in all thirty young females were very low, The Zinc values of four subjects were above normal range and Zinc values of twenty-six subjects were in normal the range. None of the subjects demonstrated the zinc values below normal the range.

The Magnesium values of seven subjectswere below the normal range (1.7 mg/dl) and twenty-three subjects were in the normal range (1.7-2.2 mg/dl). None of the subjects demonstrated the zinc values above the normal range. The most probable reason was inadequate exposure to sunlight and consumption of junk food.

INTRODUCTION

Vitamin D is a fat insoluble vitamin, known for its antirachitic activity.[Sharman *et al*.,1975] Calciferols are a group of lipid insoluble compounds with a 4 ringed cholesterol backbone and referto both, Vitamin D3, i.e., cholecalciferol and Vitamin D2, i.e., ergocalciferol.[Houghton and Vieth .,2006] Vitamin D, in general, refers to Vitamin D3. Vitamin D can be synthesized endogenously. About 90% of the required Vitamin D is synthesized in the skin under sun exposure.[Holick *et al*., 2003] It is needed for the maintenance of normal blood levels of calcium and phosphate that are required for normal mineralization of bone, muscle contraction, nerve conduction, and general cellular function in all cells of the body. It is also found to be important for immune function, for inflammation, cell proliferation, and differentiation. [Holick *et al*., 2003Kumar, *et al*., 2013] The active form of Vitamin D stimulates the absorption of calcium in the duodenum and increases calcium influx in distal tubules of kidney through nuclearVitamin D receptor (VDR); latter is specifically regulated by parathormone level.[Holick *et al*.;2005]

Zinc, an essential mineral, is naturally present in some foods, added to others, and available as a dietary supplement. Zinc is also found in some cold lozenges, over-the-counter drugs sold as cold remedies, and some denture adhesive creams. Zinc is involved in many aspects of cellular metabolism. It is required for the catalytic activity of hundreds of enzymes, and it plays a role in enhancing immune function, protein and DNA synthesis, wound healing, and cell signaling and division [Institute of Medicine report, 2001, Ryu *et al.,* 2020, King *et al.,* 2014, MacDonald *e*, 2000]. Zinc also supports healthy growth and development during pregnancy, infancy, childhood,and adolescence and is involved in the sense of taste [Ryu *et al.,* 2020, King *et al.,* 2014,]. The total amount of zinc in the body is approximately 1.5 g in women and 2.5 g in men[Ryu *et al.,* 2020]. Most of this zinc is stored in skeletal muscle and bone [Institute of Medicine report,2001, Ryu *et al.,* 2020, King *et al*., 2014].

The processes that maintain zinc homeostasis are absorption of zinc from the diet, excretion into the gastrointestinal tract, and reabsorption in the gastrointestinal lumen [Ryu *et al.,* 2020, King *etal.,* 2014]. In general, as zinc intakes rise, the amount of zinc absorbed also increases, but its fractional absorption drops [Ryu *et al.,* 2020, King *et al.,* 2014]. Serum or plasma zinc levels are typically used in clinical practice to assess zinc status. In healthypeople, the amount of zinc in serum or plasma is 80 to 120 mcg/dL (12 to 18 mcmol/L) [Ryu *et al.,* 2020]. Serum zinc levels below 70 mcg/dL in women and 74 mcg/dL in men indicate inadequate zinc status. However, both

serum and plasma measures have important limitations. Zinc concentrations in serum are associated with the patient's sex and age as well as the time of the blood draw (morning vs. evening) and do not always correlate with dietary or supplemental zinc intakes [Hennigar *et al.,* 2018]. Zinc levels also fluctuate in response to other factors, including infections, changes in steroid hormones, and muscle catabolism during weight loss or illness [Institute of Medicine report, 2001, King *et al.,* 2014]. Clinicians consider risk factors (such as inadequate caloric intake, chronic alcohol use, and mal-absorptive digestive diseases) and signs ofzinc deficiency (such as impaired growth in infants and children) when they assess a patient's zinc status [Institute of Medicine report, 2001].

Magnesium, an abundant mineral in the body, is naturally present in many foods, added to other food products, available as a dietary supplement, and present in some medicines (such as antacids and laxatives). Magnesium is a cofactor in more than 300 enzyme systems that regulate diverse biochemical reactions in the body, including protein synthesis, muscle and nerve function, blood glucose control, and blood pressure regulation [Institute of Medicine, 1997, Rude *et al.,* 2010, Rude *et al.,* 2012] Magnesium is required for energy production, oxidative phosphorylation, and glycolysis. It contributes to the structural development of bone and is required for the synthesis of DNA, RNA, and the antioxidant glutathione. Magnesium also plays a role in the active transport of calcium and potassium ions across cell membranes, a process that is important to nerve impulse conduction, muscle contraction, and normal heart rhythm [Rude *et al.,* 2012].

An adult body contains approximately 25 g magnesium, with 50% to 60% present in the bones and most of the rest in soft tissues [Volpe *et al.,* 2012]. Less than 1% of total magnesium is in blood serum, and these levels are kept under tight control. Normal serum magnesium concentrations range between 0.75 and 0.95 millimoles (mmol)/L [Institute of Medicine report, 1997, Elin *et al.,* 2010]. Hypomagnesemia is defined as a serum magnesium level less than 0.75 mmol/L [Gibson *et al.,*2005]. Magnesium homeostasis is largely controlled by the kidney, which typically excretes about 120 mg magnesium into the urine each day [Rude *et al.,* 2010]. Urinary excretion is reduced when magnesium status is low [Institute of Medicine report, 1997].

Assessing magnesium status is difficult because most magnesium is inside cells or in bone [Rude *et al.,* 2012]. The most commonly used and readily available method for assessing magnesium status is measurement of serum magnesium concentration, even though serum levels [Gibson *et al.,* 2005]. have little correlation with total body magnesium levels or concentrations in specific tissues Other methods for assessing magnesium status include measuring magnesium concentrations in erythrocytes, saliva, and urine; measuring ionized magnesium concentrations in blood, plasma, or serum; and conducting a magnesium-loading (or "tolerance") test. No single method is considered satisfactory [Witkowski *et al.,* 2011]. Some experts [Volpe *et al.,* 2012] bu tnot others [Rude *et al.,* 2012]. Consider the tolerance test (in which urinary magnesium is measured after parenteral infusion of a dose of magnesium) to be the best method to assess magnesium status in adults. To comprehensively evaluate magnesium status, both laboratory tests and a clinical assessment might be required [Gibson *et al.,* 2005].

The main aim of this research work is to estimate vitamin D and micronutrients (Zn, Mg) inyoung females.

MATERIAL AND METHODS

The study was conducted to evaluate Vitamin D levels in nutrients (Zn, Mg) inyoung females of Dehradun region from November 2021 to March 2022. Total 90 young females were enrolled in the survey, but only 30 young females were selected randomly to equalize the data with different factor and calculate the result.

A general questionnaire about socio-demographic and socio-economic characteristics, personal details, smoking and alcohol consumption, disease and medication, diet and use of food supplements was completed in a face-to-face interview. Vitamin D was estimated from the blood samples using ELISA technique and micronutrients (Zn, Mg) were estimated by colorimetric method.

RESULTS AND DISCUSSION

In the study conducted at dolphin institute at Dehradun on 30 young females. The anthropometric data is given below in the table:

PARAMETER	AVERAGE	MAXIMUM	MINIMUM
WEIGHT	50.4	65	39
HEIGHT	5	5”7	4”1
BMI	20.53	26.2	16

Table 1:The average, maximum & minimum weight, height, body & BMI of the Population

PARAMETER	AVERAGE	MAXIMUM	MINIMUM	NORMAL RANGE
VITAMIN D	4.37	10.3	3.8	20-40 ng/ml
MAGNESIUM	1.91	2.29	1.49	1.7-2.2 mg/dl
ZINC	118.38	231	89.3	60-120 ug/dl

Table 1:The average, maximum & minimum Vitamin D, Magnesium and Zinc of the Population

VITAMIN D: The decrease in the level of vitamin D can lead to a loss of bone density, which cancontribute to disease like osteoporosis and fractures (broken bones) and the increase in the level of vitamin D can lead vitamin D toxicity or hypercalcemia, which can cause nausea and vomiting,weakness, and frequent urination. The total numbers of subjects were thirty in age group of 20-30 years, all the values were below the lower normal the main reason might be inadequate exposure to sunlight.

The average mean value of vitamin D for thirty subjects was 4.37ng/ml, maximum value was 10.3 ng/ml and minimum value of vitamin d was 3.8 ng/ml. where in another study of vitamin D deficiency among female university students (18 to 25 years) done at Trakya University Faculty of Health Sciences. The average mean value was 17.32 ng/ml, [Filiz Tuna,2019] The values in our study were low as compared to Trakya univerisy study.

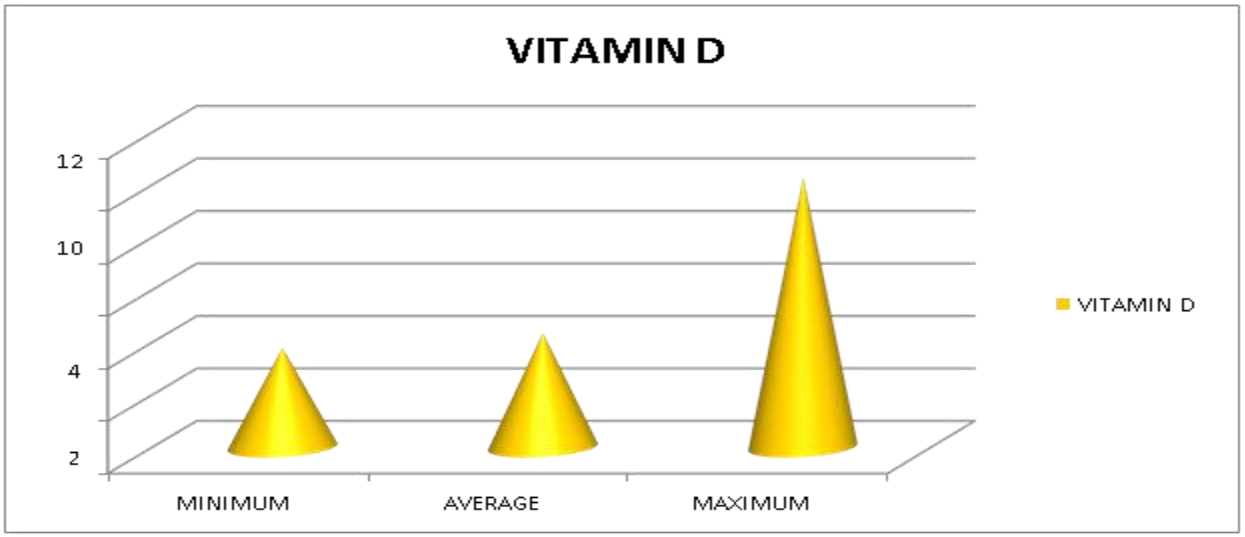

Figure 1: The graph showing minimum, average and maximum values of Vitamin D in youngfemales.

ZINC: The increase in the level of zinc signs nausea, vomiting, loss of appetite, stomach cramps,diarrhea, and headaches also too much zinc for long time can lead the problem such as low copper level, lower immunity and low level of HDL cholesterol and zinc deficiency can result in skin changes that look like eczema at first. There may be cracks and a glazed appearance on the skin, often found around mouth.

The total number of subjects were thirty in age group of 20-30 years, out of which value of four subjects were above the normal range (120ug/dl) and twenty six subjects were in the normal range (60-120ug/dl).The values of number of subjects below the normal range were zero. The average value of zinc for thirty subjects was 118.38ug/dl, maximum value was 231 ug/dl and minimum value of zinc was 88.3 ug/dl. Where in another study at Mexico City, the zinc deficiency was higher in urban females (age 20-29). The average mean value of mexican urban females was 89.1ug/dl.[Mejía-Rodríguez F *et al*,2013]. The values in our studywere high as compared to mexican urban female study.

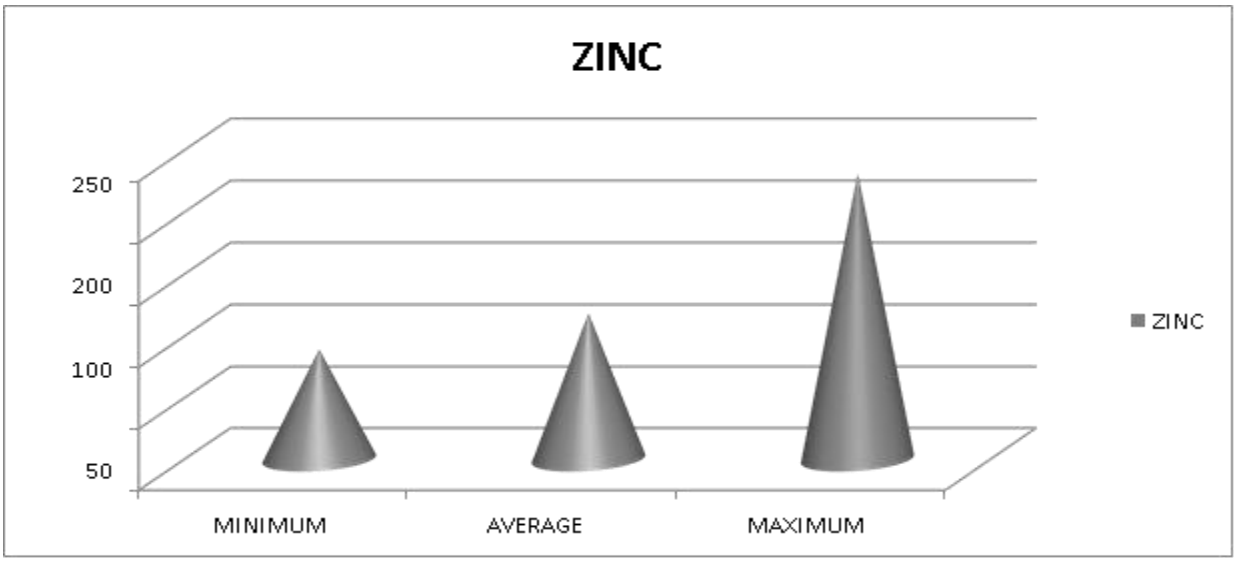

Figure 2: The graph showing minimum, average and maximum values of zinc in young females.

MAGNESIUM: The increase in the level of magnesium in body may be a sign of: Addison disease, a disorder of the adrenal glands, kidney disease and dehydration and decrease magnesiumlevel in body can weaken your bones, give you bad headaches, make you feel nervous and hurt your heart.

The total number of subjects were thirty in age group of 20-30 years, out of which value of seven subjects were below the normal range (1.7 mg/dl) and twenty three subjects were in the normal range (1.7-2.2 mg/dl). The number of subjects above the normal range is zero.

The average value of magnesium for thirty subjects was 1.91 mg/dl, maximum value was 2.29 mg/dl and minimum value of magnesium was 1.49 mg/dl. where in another study at mexico city, the magnesium deficiency was higher in urban females (age 20-29). The average mean value of mexican urban females is 1.8 mg/dl. [Mejía-Rodríguez F *et al*,2013]. The values in our study were high as compared to mexican urban female study.

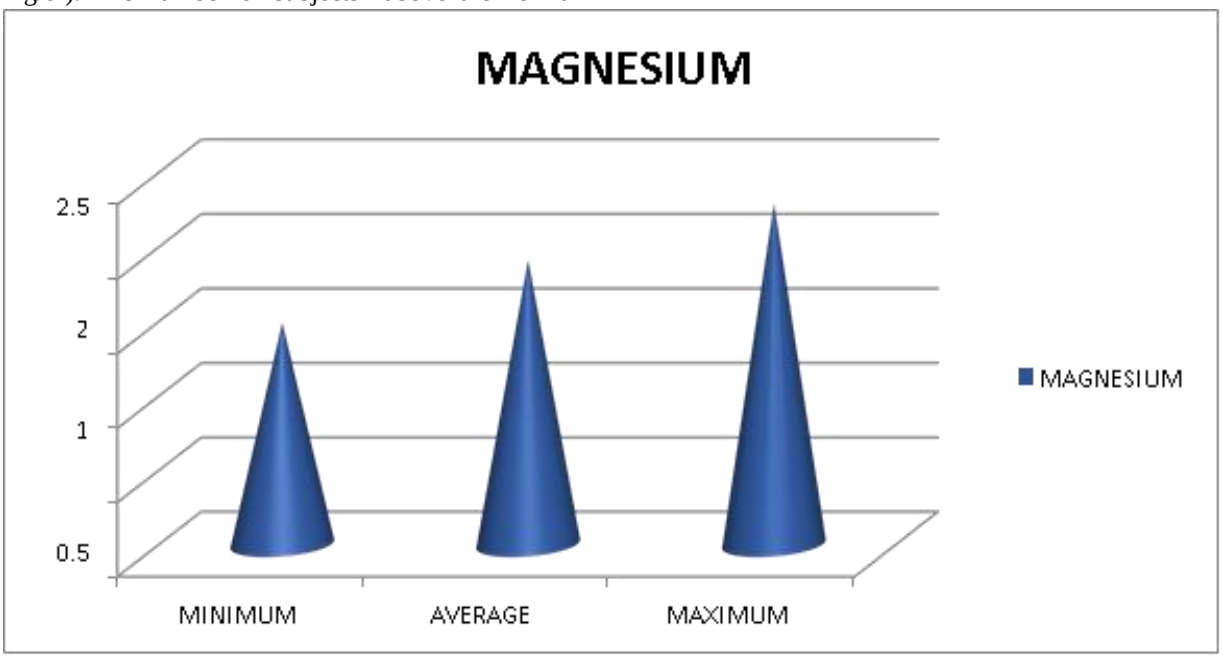

Figure 3: The graph showing minimum, average and maximum values of magnesium inyoung females.

CONCLUSION

It was observed that the status of Vitamin D in all thirty young females were very low, The Zinc values of four subjects were above the normal range and Zinc values of twenty-six subjects were in the normal range .None of the subjects demonstrated the zinc values below the normal range.

The Magnesium values of seven subjectswere below the normal range (1.7 mg/dl) and twenty-three subjects were in the normal range (1.7-2.2 mg/dl). None of the subjects demonstrated the zinc values above the normal range. The most probable reason was inadequate exposure to sunlight and consumption of junk food.

Drawback of study is that sample size is less and larger sample size is required to draw the conclusion.

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