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Serum Zinc Level Estimation- Comparison Between Normal Control And In Leprosy Patients

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ABSTRACT

Leprosy is a chronic infectious disease caused by *Mycobacterium leprae*. It principally affects the cooler parts of the body, mainly skin and peripheral nerves. Leprosy involves wide range of biochemical as well as immunological changes in the body including trace elements such as zinc, copper and magnesium. After iron, zinc is the second most abundant trace element in the body. This study has been undertaken to correlate with clinical presentations wherever possible and to investigate the level of serum zinc in leprosy. Study included 63 newly diagnosed leprosy. Cases were further distributed according to clinical subtypes and were compared to controls. Venous blood samples were collected and estimation of serum zinc level has been done with serum. Maximum patients detected were of Intermediate Leprosy (26.9) where as lesser (1.58) were of Histoid type. Pure tuberculoid and Indeterminate leprosy group showed minimum decrease and pure lepromatous and Erythema nodosum leprosum group showed maximum decrease in Serum Zinc level i.e. leprosy patients with increased bacterial load have decreased serum zinc levels. This suggests that there could be a correlation of serum zinc levels and the bacillary load.

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1. Introduction

Leprosy involves multiple organs (skin, nerves, liver and kidney), that leads to wide range of biochemical as well as immunological changes in the body including trace elements such as zinc, copper and magnesium. After iron, zinc is the second most abundant trace element in the body.

Leprosy is a chronic granulomatous disease caused by *Mycobacterium leprae*, principally affecting peripheral nerves and skin. (1) *Mycobacterium leprae*, the causative agent of leprosy, was discovered by G. H. Amiauer Hansen in Norway in 1873, making it the first bacterium to be identified as causing disease in humans. (2)

Over the years, prevalence increased from 8.4 cases per 10,000 populations in 1966 to a peak of 12 per 10,000 in 1985. Since then there has been a steady decline, and at the beginning of 2008, the global prevalence rate of leprosy was below 1 per 10,000 population.

Today the highest burden is concentrated in 6 countries, in diminishing order disease burden in India, Brazil, Indonesia, Myanmar, Bangladesh, and Nepal. India harbors 65% of the world's population of Leprosy patients. Based on the reports from all the states and UTs for the year 2007-08 the current leprosy situation in India is as follows. A total of 1.38 lakhs new cases were detected during the year 2007-08.

Normal serum level of zinc is 60-120 g/dl 70% of which is bound to albumin and most of the rest is associated with 2-macroglobulin and a small amount of uncharacterized protein. (3) Zinc is an essential mineral. It is required for the catalytic activity of approximately 100 enzymes and it plays a role in immune function, (3) protein synthesis, (4) wound healing, (5) DNA synthesis, and cell division. A daily intake of zinc is required to maintain a steady state because the body has no specialized zinc storage system. Oon BB, et al (6) measured skin and serum zinc in patients with leprosy with and without trophic skin ulceration. Serum zinc concentrations were decreased in leprosy irrespective of the presence or absence of skin ulceration.

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Tubercuoid, which consisted mainly of borderline tuberculoid patients and lepromatous. The lepromatous group was found to have significantly lower serum levels of zinc and elevated levels of copper. The mechanism due to a redistribution of these metals from the blood to various tissues; brought about by the release of leucocyte endogenous mediators by continuing phagocytosis of tissue macrophages in the lepromatous group of patients.(8)

Low serum zinc concentrations are found in various physiological as well as pathological conditions such as in Pregnancy and lactation, amongst pure alcoholics, people suffering from gastrointestinal and liver disease and in cases of sickle cell disease. Low serum zinc level in leprosy patients also is shown by various workers.

Materials and Method

The study has been carried out at Tertiary Health Care Centre, Bhopal. It included 63 newly diagnosed cases of leprosy between the age group of 10-71. They were compared to gender and socio-economic status matched controls.

Exclusion Criteria

Leprosy patients suffering from diabetes mellitus, hepatitis, nephritis and other systemic disease or chronic illness like Tuberculosis.

Leprosy patients undergoing treatment.

Old treated cases without Leprea reaction.

Control Group :

Blood sample from normal subjects coming to Blood Bank of Tertiary Health Care Center for blood donation in the age group of 18 to 60 years were collected and classified in each decade equally for males and females for their serum zinc level. An informed consent was taken from the donors before collecting blood sample for serum zinc level.

Blood sample :

5 ml of venous blood of patients were collected in EDTA vial and plain vial from the antecubital vein taking universal precautions. Sample was centrifuged, serum separated and estimation of serum zinc level was done.

Estimation of serum Zinc Level :

Serum, zinc level is estimated by Colorimetric Method using Semi-auto analyzer MICROLAB 200 from MERCK (Germany) and Zinc kit manufactured by Coral-Tulip by CREST ECOSYSTEMS (Goa, India) in the Tertiary Health Care Centre, Bhopal.

Results

This study was histopathology based clinico-pathological correlation study of different subtypes of leprosy along with estimation of serum zinc level among the different subtypes.

Most encountered type of leprosy was IL(26.9) and BT(20.6), whereas less incidences were of ENL(4.7).Table 1

Serum zinc level has been found to be reduced in LL and ENL subtypes of Leprosy patients

Distribution Of Cases According To Clinical Subtypes Of Leprosy

Types	TT	BT	BB	BL	LL	IL	PN	ENL	Histoid	Total
No.of Cases	6	13	1	10	10	17	2	3	1	63
%	9.5	20.6	1.58	15.8	15.8	26.9	3.17	4.7	1.58	100

Average Serum Zinc Level In Study Groups

Types	IL (17)	TT (3)	BT (17)	BB (2)	BL (14)	LL (6)	ENL (2)	PN (2)	Control Group (71) (Normal Range)
Avg. Serum Zinc(g/dl)	93.14	91.26	83.41	90.5	67.88	57.08	53.63	85.37	110.58 (60-120 g/dl)

Statistical Analysis Of Serum Zinc Level In Different Subtypes Of Leprosy

Subtypes	Range	Mean	Standard Deviation	t-test(Score)
Control (71)	83.0-127.8	110.58	10.80	-
IL(17)	42.4-108.3	93.14	14.11	5.54
TT(3)	89.0-93.3	91.26	2.15	9.9
BB(2)	78.0-103	90.5	17.67	13.11
PN(2)	72.5-98.25	85.37	18.20	11.89
BT(17)	60.0-88.7	83.41	5.77	3.05
BL(14)	42.4-90.2	67.88	11.96	2.5
LL(6)	49.5-62.0	57.08	4.19	3.13
ENL(2)	52.0-55.26	53.63	2.30	7.34

Discussion

Pure tuberculoid and Indeterminate leprosy group showed minimum decrease and pure lepromatous and Erythema nodosum leprosum group showed maximum decrease in Serum Zinc level i.e. leprosy patients with increased bacterial load have decreased serum zinc levels. Results obtained from our study of serum zinc are in agreement with those of earlier researchers such as Sher R, et al (1981), Rao KN (1985), Saxena N, et a) (1988), George J, et al (1991), Mennen U, et al (1993), Sethi NC, et al (1996), and Brig P, ct al (2002).Zinc is an important antioxidant, immunostimulant trace elements with a great nutritional and metabolic value. In the present study fall in serum zinc level was significant and more pronounced. This suggests that there could be a correlation of serum zinc levels and the bacillary load.

Sher et al suggested that mechanism of alteration in trace element level could be due to redistribution of these metals from blood to various tissues, brought about by the release of leucocyte endogenous mediators by continuing phagocytosis by macrophages in leprosy patients.

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