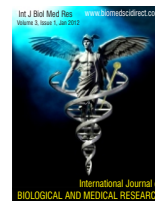


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Original Article

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 Lepra 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 al (1988), George J, et al (1991), Mennen U, et al (1993), Sethi NC, et al (1996), and Brig P, et 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.

Bibliography:

- [1] Rook's Textbook of Dermatology, 8th edition vol.2, p-1814-25
- [2] Dharmendra .Leprosy, Vol.1. Bombay: Kothari Medical Publishing House. p-43-46.
- [3] Holden (2009). "Skeleton Pushes Back Leprosy's Origins". Accessed on 31st Jan. 2010.
- [4] Leprosy for medical practitioners and paramedical workers, S.J. Yawalkar Eighth revised edition, 2009. P-58-72
- [5] Hansen GHA (1874). "Unders gelser Angaende Spedalskhedens Arsager (Investigations Concerning the etiology of leprosy)" (in Norwegian. Norsk Mag. Laegervidenskaben 4:1-88.
- [6] The discovery of the leprosy bacillus .Tidsskr nor Laegeforen 122(7):pubmed/11998735. Accessed on 23 April 2010.
- [7] Ryan KJ ,Ray CG .Sherris Medical Microbiology (4th ed .) Mcgraw Hill. P p.451-3.
- [8] McMurray DN (1996). "Mycobacteria and Nocardia." .In Baron S. Et al, eds..Baron's Medical Microbiology 4th edition .p-340-53
- [9] Thomas Shinnick, The Prokaryotes Part B, p-934-944.
- [10] Solomons NW. Mild human zinc deficiency produces an imbalance between cell mediated And humoral immunity. Nutr Rev 1998;56:27-8.
- [11] Prasad AS. Zinc: an overview. Nutrition 1995;11:93-9.
- [12] Rink L, Gabriel P. Zinc and the immune system .Pric Nutr Soc 2000;59:541-52.
- [13] Alternative Medications and Other Treatments for Tinnitus. 2nd edition p-432-444
- [14] Akita Abe, Yianmasshita, S., (1989) Clin. Chem. 35/4:552-554.
- [15] Wintergest ES, Maggini S, Hornig DH. Contribution of selected vitamins and trace Elements to immune function. Ann Nutr Metab 2007;51:301-23.
- [16] Ooc BB, Khong KY ,Greaves MW ,Plummer VW .Tropic skin ulceration of leprosy skin And serum zinc concentration. Brit Med Journal 1974;2:531-553.
- [17] Sheskin J, Zeimer R. In vivo study of trace elements in leprosy skin .Int J Dermatol 1977;16(8):745-747.
- [18] Sher R, Shulman G, Bailey P, Politzer WM. Serum trace elements and vitamin A in leprosy Subtypes. Am J Clin Nutr 1981;34:1918-1924.
- [19] Venkatesan K, Kannan KB, Bharadwaj VP ,et al. Serum copper and zinc in leprosy and Effect of oral zinc therapy. Indian J Med Res 1983;79:37-41.
- [20] Mathur NK ,Bumb RA, Mangal HN, Sharma ML .Oral zinc as an adjunct to dapsone in Lepromatous leprosy. Int J Lepr 1984(b);52(3):331-338.
- [21] Rao KN, Gupta JD, Sehgal VN, et al .Trace elements in sera of Leprosy spectrum Indian J Lepr 1985;57:556-561.
- [22] Saxena N, Sharma PR, Singh VS. Study of serum zinc levels in leprosy .Indian J Lepr 1988;60(4):556-561.
- [23] George j, Bhatia VN ,Balakrishnan S, Gama G, serum zinc/ copper ration in subtypes of Leprosy and effect of oral zinc therapy on reactional states .Int J Lepr 19991;59(1):20-24.
- [24] Menen U, Howells C, Wiese AJ. Serum zinc sodium ,calcium ,magnesium and Potassium Levels and standard diet in leprosy patients .Indian J Lepr 1993;65:415-421.
- [25] Sethi NC, Medadi AJ, Bhandari S. Serum zinc copper magnesium ,proteins and Superoxide dismutase in leprosy patients on multidrug therapy – A follow –up study. Indian J Lepr 1996;68(4):325-333.
- [26] Gupta A, Sharma VK, Vohra H, Ganguly NK. Inhibition of apoptosis by ionomycin and Zinc in peripheral blood mononuclear cells of leprosy patients. Clin Exp Immunol 1990; 117(1):56-62.
- [27] Brig PN Arora (Retd), Maj KS Dhillon, Dr. SR Rajan, Col SK Sayal, Lt Col Al Das. MJA FI 2002;58:304-3-6.
- [28] John D. Bancroft, Theory and Practice of Historical Techniques ,6th edition, 126, 315+
- [29] Akita Abe, Yiamashita, S., (1989) Clin. Chem. 35/4:552-554.
- [30] Tetsuo Makino, (1991) Clin. Chem. Acta. 197:209-220.
- [31] Guha PK, Pandey SS, Singh G, Kaur P. Age of Onset of Leprosy .Lepr India 1981;53(1):83-87.
- [32] Kaur S, Kumar B, Roy SN .Endemicity of leprosy in union territory of Chandigarh and Surrounding states .Lepr India 1982;54(3):428-440.
- [33] Sehgal VN, Ghorpade A, Saha K. Urban leprosy Control Programme in Mexico. Int J Lepr 2004;72(4):427-430.
- [34] Narasimha RP, Pratap DVS, Ramanareddy AV, Sujai S. In evaluation of leprosy with 1- 5 Skin lesions with relevance to their grouping into paucibacillary or multibacillary IJ DVL 2006;72(3):207-10.
- [35] Verma OP . Some epidemiological features of leprosy in a rural area in Hooghly District. Lepr India 1976;48(4):371-381.
- [36] Nandarni NS, Rege VL. Significance of histopathology classification in leprosy .Indian J Lepr 1999;71(3):325-329.
- [37] Shenoi SD, Siddappa K. Correlation of clinical and histopathological features in untreated Macular lesions of leprosy – A study of 100 cases .Indian J Lepr 1988;60(2):202-05.
- [38] Ashok Kumar SK, Reddy BSN, Ratnakar C. Correlation of skin and nerve histopathology In Leprosy .Lepr Rev 1996;67:119-125.