SUMMARY AND CONCLUSION
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The present study "THE STUDY OF SERUM ZINC AND COPPER ALTERATIONS IN INFECTIOUS DISEASES", was carried out over a period of one year in the Department of Paediatrics, M.L.B. Medical College and Hospital, Jhansi, U.P. and Central Drug Research Institute (CDRI), Lucknow with the following main objectives.

1- To study the levels of serum copper and zinc in infectious diseases in Bundelkhand region.

2- To find out the correlation of levels of serum copper and zinc during the recovery phase (7-10 days after starting chemotherapy). Estimation of copper and zinc were carried out by atomic absorption spectrophotometry technique (Model - PERKIN ELMER1100 B) in the Division of Endocrinology, CDRI, Lucknow, U.P.

Besides estimation of these elements, a thorough general, physical and systemic examination of each case was conducted and investigations were carried out according to disease concerned.

We excluded the patients of infectious diseases who were having severe grade of malnutrition, renal disorders, liver disorders (except cases of infective hepatitis), gross oedema.
Cases were categorised into two groups:

(i) Study group
(ii) Control group

Study group comprised of 54 children and 10 age and sex matched healthy controls. Cases selected were between the age group of 1 year to 12 years. Study group categorised into three according to pattern of diseases.

(i) Bacterial
(ii) Viral
(iii) Protozoal

(i) Bacterial group further divided into two:

(1) Tubercular:
   e.g. (i) Primary pulmonary tuberculosis - 5
        (ii) Tubercular meningitis - 7

(2) Non-tubercular:
   e.g. (i) Enteric fever - 10
        (ii) Lobar pneumonia - 6
        (iii) Pyogenic meningitis - 6

(ii) Viral infections divided into two groups:
    e.g. (1) Infective hepatitis - 5
         (2) Postmeasles bronchopneumonia 5

(iii) Protozoal infections: e.g. Malaria - 10
Serum Zinc and Copper:

(1) Mean serum levels for zinc and copper in controls were 114.44 ± 4.11 ug/100 ml and 99.27 ± 1.61 ug/100 ml respectively. These values were compatible with mean values reported in the recent literature.

(2) Mean serum zinc value in primary pulmonary tuberculosis was significantly low (64.68 ± 5.68 ug/100 ml) as compared to controls which after 7-10 days of antitubercular therapy rose to 68.27 ± 6.85 ug/100 ml but still remained significantly lower than control. Statistically there was insignificant difference between the mean value of zinc on day zero and after 7-10 days of antitubercular therapy (p > 0.1). Mean serum copper value on the day zero was significantly higher (117.78 ± 4.06 ug/100 ml) as compared with controls which fell to 110.47 ± 4.01 ug/100 ml after 7-10 days but was still higher than controls. Fall was insignificant.

(3) Mean serum zinc value in tubercular meningitis was significantly lower (76.80 ± 14.02 ug/100 ml) as compared to controls. After 7-10 days of chemotherapy it rose to 85.92 ± 13.66 ug/100 ml. This rise was statistically insignificant (p > 0.5).
Mean serum copper value on the day zero was significantly higher \((126.21 \pm 9.39 \text{ ug/100 ml})\) than controls; after 7-10 days of chemotherapy decreasing trend was found \((125.96 \pm 8.91 \text{ ug/100 ml})\) but this reduction was insignificant \((p \geq 0.5)\).

(4) Mean serum zinc in enteric fever on the day zero was significantly lower \((73.08 \pm 17.51 \text{ ug/100 ml})\) as compared to controls. But after 7-10 days of treatment rose to \(84.44 \pm 20.36 \text{ ug/100 ml}\). The rise was insignificant \((p \geq 0.1)\).

Mean serum copper value on the day zero was significantly higher \((118.13 \pm 4.83 \text{ ug/100 ml})\) as compared to controls; after 7-10 days of treatment value was found to be decreasing but this decrease was insignificant \((p \geq 0.1)\).

(5) Mean serum zinc in lobar pneumonia was found significantly lower \((78.55 \pm 2.93 \text{ ug/100 ml})\) than control value, after 7-10 days of chemotherapy it rose to \(85.86 \pm 4.21 \text{ ug/100 ml}\). This rise was insignificant. Mean serum copper value on the day zero was \(132.91 \pm 6.85 \text{ ug/100 ml}\) which was significantly higher than controls. The value was found to be decreasing after 7-10 days of treatment, but the reduction was insignificant \((p \geq 0.1)\). Values were similar as in the literature.
(6) Mean serum zinc in pyogenic meningitis on the day zero was significantly lower (67.88 ± 2.76 ug/100 ml) as compared to controls. The value rose to 70.96 ± 0.80 ug/100 ml after 7-10 days but was still lower than controls. The rise was insignificant (p > 0.1).

Mean serum copper on the day zero was 128.73 ± 6.43 ug/100 ml, and the decreasing trend was observed (120.30 ± 0.34 ug/100 ml) after 7-10 days but the reduction was insignificant (p > 0.1).

(7) In infective hepatitis the mean serum value of zinc on the day zero was significantly lower (59.72 ± 3.90 ug/100 ml) as compared with control. This was found to be rising after 7-10 days (61.26 ± 1.32 ug/100 ml), but the difference was statistically insignificant (p > 0.5).

Mean serum copper value on the day zero was 124.80 ± 2.63 ug/100 ml which was significantly higher than control; after 7-10 days the value fell to 115.60 ± 3.15 ug/100 ml, the difference being significant (p < 0.05).

(8) Mean serum zinc in postmeasles bronchopneumonia was significantly lower (78.68 ± 5.25 ug/100 ml) on day zero when compared with controls. It rose to 81.75 ± 1.83 ug/100 ml after 7-10 days of treatment, but the difference was insignificant (p > 0.1).
Mean serum copper on day zero was $126.26 \pm 2.97$ ug/100 ml which was significantly higher than control. The decreasing trend was found after 7-10 days ($123.65 \pm 2.58$ ug/100 ml), the difference was not significant ($p \gtrsim 0.1$).

(9) In malaria, the mean serum zinc value was also significantly lower ($67.42 \pm 3.39$ ug/100 ml) as compared to controls. It rose to $73.06 \pm 1.51$ ug/100 ml after 7-10 days of antimalarial therapy, rise was statistically significant ($p \lesssim 0.02$).

Mean serum copper on day zero was $122.50 \pm 4.67$ ug/100 ml which was significantly higher than control after 7-10 days of treatment fall to $117.86 \pm 4.15$ ug/100 ml, but the difference was no significant ($p \gtrsim 0.5$).

(10) Statistically there was insignificant difference ($p \gtrsim 0.5$) between tubercular vs non tubercular, tubercular vs viral infections, tubercular vs protozoal infections, nontubercular vs viral infections, nontubercular vs protozoal infectious and viral vs protozoal infections.

Therefore it could be concluded that:

(1) We have excluded the cases who were having severe grade of malnutrition, massive oedema, liver disorders(except hepatitis)renal disorders. Therefore the alterations in the serum zinc and copper values in the present study were due to infections.
(2) In general our findings were at par with those of recent studies in literature.

(3) A significant alterations in the serum zinc and copper were observed in both acute as well as in chronic infections. In general there was fall in serum zinc values and rise in serum copper values.

(4) There was tendency for serum zinc and copper to move towards normal values in both acute and chronic infections. After 7-10 days of initiation of therapy though the value still remains significantly altered.

(5) The magnitude of alteration was same in both acute and chronic infections prior to initiation of therapy. Hence various types of infections can not be differentiated by simply estimating the serum zinc and copper.