

Serum Ceruloplasmin And Copper In Filariasis

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Abstract

Serum ceruloplasmin and copper levels were assayed in 42 filariatic patients. They were divided into elephantiac and microfilariatric cases according to the severity of infection. Both serum copper and ceruloplasmin were in the normal range in elephantiac stage except 36 % of tested cases showed elevated serum copper than normals. In microfilariatric cases, both serum copper and ceruloplasmin were markedly increased, while 29 % of cases showed normal serum copper. Both were highly significantly different as compared to controls. The significance of these data is fully discussed.

Introduction

Filariasis occurs in man as a result of infection with certain filarial worms including Wuchereria bancrofti, Wuchereria malayi, Loa Loa & Onchocerca volvulus. Infection with Wuchereria bancrofti is commonly called bancroftian filariasis. The full manifestation of the disease develops in youth and is seldom recorded

in very young children under the age of two years. The adult worms inhabit lymphatic vessels and nodes. The microfilariae are first expelled into these areas and later into blood stream.

The present study is to investigate the effect of filariasis on serum ceruloplasmin and copper levels. Ceruloplasmin is a copper-containing alpha₂-globulin. It is believed to play a role in copper transport and absorption.

Materials and Methods

The material of study consisted of 59 cases from endemic areas. They aged from 25 to 40 years. 17 cases were taken as controls, they gave negative intradermal test on using Dipetalonema evansi antigen, 17 cases with microfilariae in the blood as diagnosed by thick blood film at mid-night. This group was selected to represent the inflammatory stage of the disease. 25 cases were chosen to represent the elephantiac stage of the disease and diagnosed by the clinical picture and by the indirect haemagglutination test using Dipetalonema evansi antigen. Blood samples were taken in the mid-night, sera separated. Ceruloplasmin (copper - oxidase) has been estimated according to the method described by Ravin (1961) in which it can catalyze the oxidation of P-phenylenediamine and the extent of the latter process is used as a measure of ceruloplasmin. amount present in serum. Serum copper was estimated by the method of Gubler et al (1952 A) depending on the measurement of the depth of the colour of its reaction with sodium diethyldithiocarbamate.

Results

The data obtained for serum ceruloplasmin and copper in the material of study are shown in Tables I, II, III and g figure. In normals, ceruloplasmin level ranged from 49.0 - 117.8 (90.7 ± 5.6) mg / 100 ml serum. The normal serum copper level was 88 - 170 (138 ± 6.9) U_g / 100 ml. Whereas the serum levels of ceruloplasmin and copper in the 25 cases showing symptoms of elephantiasis were 46.0 - 135.3 (75.4 ± 4.7) mg / 100 ml and 103 - 225 (154.4 ± 6.4) U_g / 100 ml, respectively. However, 9 cases (case no. 14, 15, 16, 17, 18, 19, 20, 21, 25) out of the 25 showed higher serum copper values (i.e. 36 %) of elephantiasis cases. Their ceruloplasmin was in the normal level. Both serum ceruloplasmin and copper were significantly different from control values ($P < 0.05$).

In our group of microfilaraemia, serum ceruloplasmin and copper values were 117.9 - 248.7 (151.2 ± 8.9) mg / 100 ml and 145 - 260 (195.9 ± 9.4) U_g / 100 ml serum, respectively. Levels of ceruloplasmin were elevated than normals for all cases. The same increase for serum copper except 5 cases (case no. 1, 2, 3, 4, 5) out of 17 (i.e. 29 %) have normal serum copper. Both ceruloplasmin and copper levels were highly significantly different as compared to control values ($P < 0.05$).

Table: I Serum Ceruloplasmin (mg /100 ml) and Copper (Ug /100 ml)
for Normals

case no.	serum ceruloplasmin	serum copper
1	117.80	141
2	101.20	158
3	91.50	168
4	57.60	144
5	78.50	170
6	96.00	88
7	117.80	105
8	87.30	146
9	102.10	158
10	49.00	141
11	117.80	167
12	70.00	158
13	96.00	88
14	49.00	103
15	96.00	140
16	117.80	117
17	96.00	115
Range	49.00 - 117.80	88 - 170
Mean	90.70	138
± S.E.	5.56	6.87

Table II: Serum Ceruloplasmin (mg /100 ml) and Serum Copper (Ug /100 ml) in Elephantiasis (25 cases)

Case no.	serum ceruloplasmin	serum copper
1	61.1	145
2	65.4	145
3	87.3	135
4	71.6	155
5	101.2	153
6	46.0	145
7	68.1	105
8	49.0	155
9	56.7	145
10	56.7	105
11	69.0	155
12	82.9	153
13	49.0	117
14	65.4	190°
15	69.8	175 °
16	78.5	178 °
17	52.4	225 °
18	61.1	200 °
19	61.1	197 °
20	135.3	175 °
21	65.5	178 °
22	109.1	103
23	113.4	145
24	104.7	105
25	104.7	175 °

° denotes higher values than controls.

Range 46.0 - 135.3 103 - 225

Mean 75.4 154.4

± S.E. 4.7 6.4

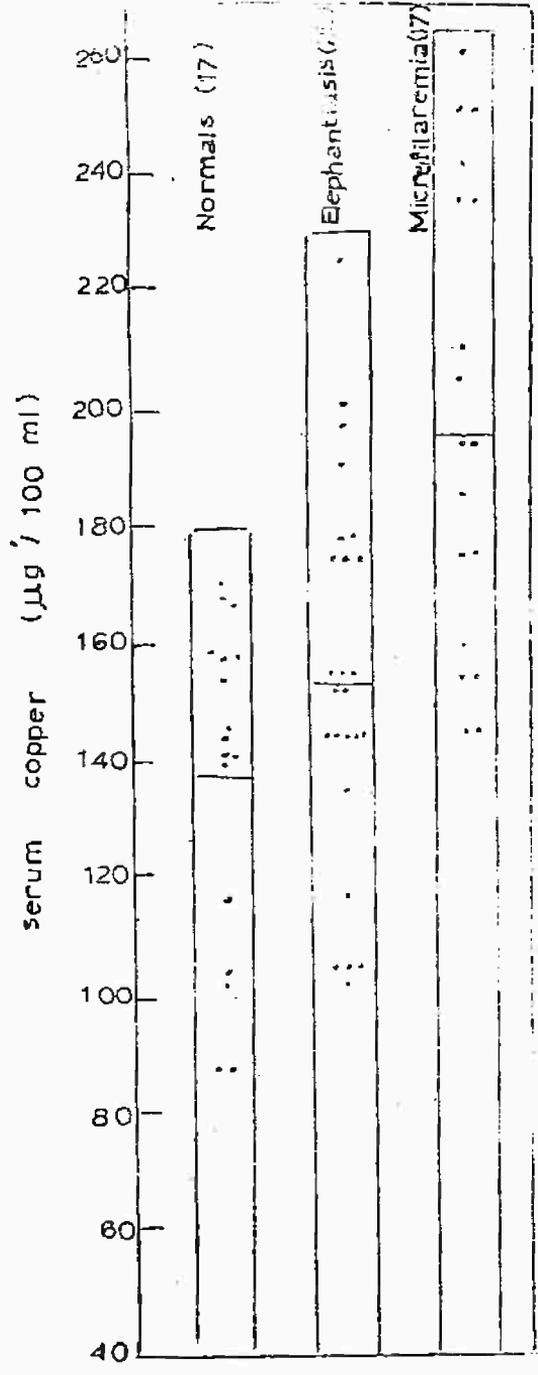
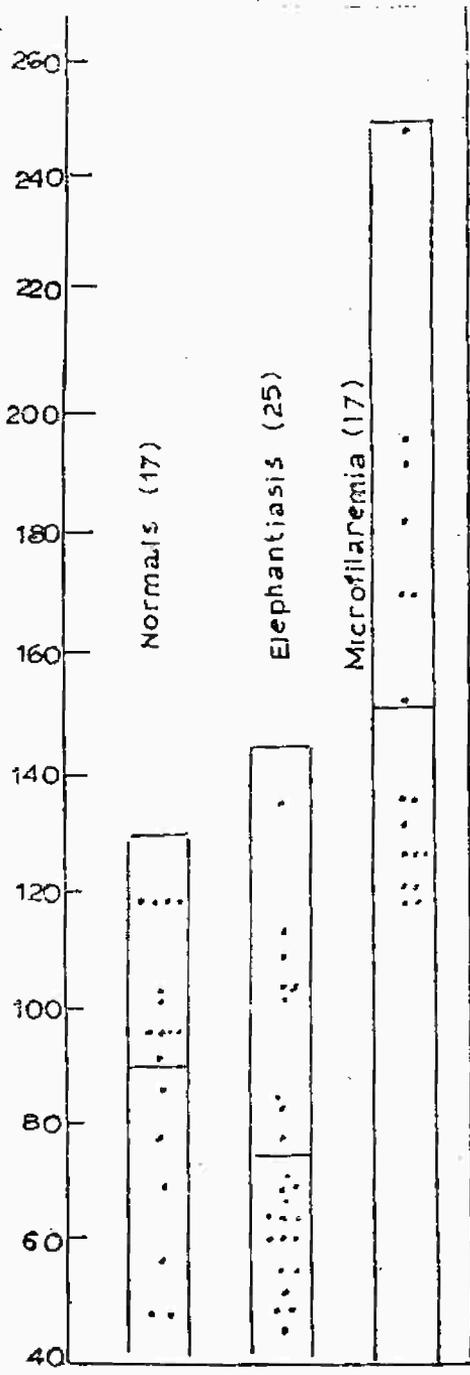
P < 0.05 (significant) < 0.05 (significant)

Table III: Serum ceruloplasmin and Serum copper in Microfilariae
(17 cases)

Case no.	serum ceruloplasmin	serum copper
1	126.5	155 N
2	118.2	145 N
3	130.9	145 N
4	120.4	160 N
5	170.2	155 N
6	126.5	260
7	117.9	185
8	126.5	250
9	135.3	175
10	120.7	195
11	192.0	205
12	183.0	250
13	151.8	195
14	248.7	210
15	170.2	235
16	196.3	235
17	135.3	175

N denotes normal level.

Range	117.9 - 248.7	145 - 260
Mean	151.2	195.9
+ S.E.	8.95	9.42
P	< 0.01 (significant)	< 0.01 (significant)



Serum ceruloplasmin and copper levels for normals , elephantiasis and microfilaremia

Discussion

Blood samples were taken at mid-night because the filarial worms migrate to peripheral blood vessels at night.

The present data indicates the normal level for both ceruloplasmin and copper are in accordance with data previously reported for normals (El-Nabawi et al, 1970 and El-Hawary et al 1973). The normal serum ceruloplasmin and copper in cases showing elephantiasis is a result of normal liver function. There is moderate increase in serum copper level for 36 % of the tested cases. This moderate serum copper increase is in accordance with the findings of Wysock (1958) in cases of uncomplicated fibrosis. It is suggested that this finding may denote liver involvement leading to the release of some of its copper content into circulation (El-Hawary et al, 1973 and Khalifa et al, 1972).

On the other hand, the microfilaræmic tested cases showed significant increases in both ceruloplasmin and copper than normals. This overall tendency of hyper-cupremia in severe infection is in agreement with reports of other workers (Gubler et al, 1954, Heldig, 1954 and Khalifa et al, 1972).

Several studies showed that viral and microbial infections, portal, biliary cirrhosis and myocardial infarctions showed a decrease in ceruloplasmin content which has been found concomitant with the increase in copper concentration (Markowitz et al, 1955). These diseases are characterized by a change in serum protein distribution. This change can be possibly due to inability of the damaged liver tissue to synthesise the polypeptide, as it is well known that the liver is the main site for its formation. It is also suggested that the increase in serum copper and ceruloplasmin was found to be related to the activity of the disease. The enzymatic activity determination might be utilized

is a non-specific laboratory test for establishing the severity of infection. In our opinion ceruloplasmin level is a more sensitive laboratory investigation and should put the physician on guard for more close and longer follow up of cases.

The findings in the present work of uniform increase in serum ceruloplasmin in microfilariasis lead one to suggest the possibility of considering increased serum ceruloplasmin level as a criterion of the extent and magnitude of tissue destruction in an immunologic disease, of proved streptococcal infective antecedence. It is of interest to add the finding reported by Bazhkov (1967) concerning changes in oxidase activity of ceruloplasmin in rats after successive infection with B.hemolytic streptococcus strain H-46-A every two weeks to produce experimental myocarditis. Ceruloplasmin synthesis was increased during the active phase of the process and dropped with its decline.

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