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An evaluation of trace metal levels in patients with anorexia nervosa

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TITOLO

Una valutazione dei livelli sierici di alcuni oligoelementi in pazienti con anoressia nervosa

KEY WORDS

Anorexia nervosa, malnutrition, copper

PAROLE CHIAVE

Anoressia nervosa, malnutrizione, rame

Summary

Anorexia Nervosa (AN) is characterized by serious malnutrition and metabolic derangement. Trace metal levels and other biochemical parameters were measured in 13 AN patients. Average serum copper concentration was 82.8 ± 26 $\mu\text{g/dl}$. Copper levels were below the lower limit of normal range in 46% of patients. Copper deficiency might be involved in reduced intake of food, via an impairment in smell and taste.

Riassunto

L'Anoressia Nervosa (AN) è una malattia caratterizzata da severa malnutrizione e da numerose alterazioni metaboliche. In 13 pazienti anoressici sono stati esaminati i livelli sierici di alcuni oligoelementi ed altri parametri biochimici. La cupremia media era di $82,8 \pm 26$ $\mu\text{g/dl}$: essa risultava al di sotto del limite inferiore di normalità nel 46% dei pazienti. Lipocupremia potrebbe contribuire a ridurre l'assunzione di cibo, attraverso l'interferenza con i sensi dell'olfatto e del gusto.

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Anorexia nervosa (AN) is estimated to be the third most common chronic medical disease in girls aged 15-19 y, affecting 0.5-1% of girls in Western countries (1). The usual age of onset is 10-30 y (2). It is characterized primarily by severe malnutrition, as well as psychological disturbance (1). Apart from symptoms secondary to starvation, such as bradycardia, hypothermia, and hypotension, clinical symptoms of vitamin deficiencies have been rarely reported (3).

Deficiencies in trace metals, particularly copper, are not unexpected in AN (3).

From a clinical point of view, an investigation of essential trace metals in AN would be of interest because trace metals, including copper, play a role in taste and smell (4). Therefore, copper deficiency might be involved in abstinence from food (3).

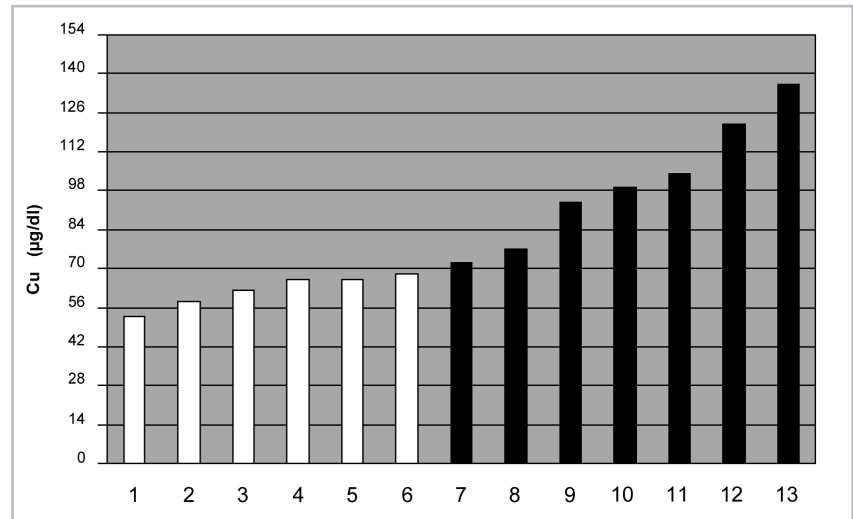
Aim of our study was to evaluate serum levels of the trace metals copper and zinc in a group of patients with AN.

Patients consecutively seen for 5 months at the Outpatient Clinic of Department of Internal Medicine "F. Magrassi - A. Lanzara", Second University of Naples, Via Pansini 5, Naples (Prof. G. Guarino) and Athena - Casa di Cura Villa dei Pini, Division of General Medicine, Via Matese 42, Piedimonte Matese (CE), Italy, were included in the study. Clinical history and physical examination were repeatedly carried out in all patients. We have diagnosed AN according to the Diagnostic and Statistical Manual of mental disorders - Text Revision - Criteria (2):

- Refusal to maintain body weight at or above a minimally normal weight for age and height: weight loss leading to maintenance of body weight <85% than expected or failure to make expected weight gain during growth, leading to body weight <85% than expected.
- Intense fear of gaining weight or becoming fat, even though under weight.
- Disturbance in the way one's body weight or shape are experienced, undue influence of body weight or shape on self evaluation, or denial of the seriousness of the current low body weight.
- Amenorrhea (at least three consecutive cycles) in postmenarchal girls and women.

Biochemical parameters and trace metal concentration were measu-

Figure 1 - Concentration of Cu in 13 patients with anorexia nervosa. White bars indicate patients with copper deficiency. Black bars indicate patients with normal copper levels



red by standard techniques. Concentrations are indicated as means \pm standard deviations.

Thirteen patients with AN, 7 F and 6 M, age 10-11 years, were studied. The age of debut of disease was 10 ± 1 years. Three girls had episodes of bulymia with purging behaviour (self-induced vomiting or the misuse of laxatives, diuretics, or enemas).

Amenorrhea is defined as periods occurring only following hormone (e.g., estrogen) administration.

Average copper concentration was 82.8 ± 26 $\mu\text{g}/\text{dl}$.

Copper serum levels of individual patients are shown in the figure 1. In 6 out of 13 patients (46%), they were below the normal range (70-150 $\mu\text{g}/\text{dl}$) (5).

Zinc serum concentration was 100.6 ± 18 $\mu\text{g}/\text{dl}$ (normal range = 70-140 $\mu\text{g}/\text{dl}$) (5).

Biochemical parameters are indicated in the table 1.

Copper is the third more abundant trace element in the human body, following zinc and iron. It is involved in the transfer of electrons and in tying them to organic molecules (7). Deficiency is present in rare genetic disorders (Mencke's syndrome and Wilson's disease), or in prolonged malnutrition and starvation (8). The low plasma copper levels in half of our patients suggests that dietary factors were primarily responsible. Symptoms of copper deficiency include hypochromic anemia, ataxia, neutropenia, osteoporosis and

Table 1. Biochemical parameters in 13 patients with anorexia nervosa (6)

Parameters observed	Mean \pm SD	Standard values
Albumin (g/dl)	2.6 \pm 0.6	3.5-6
Iron (μ g/dl)	25 \pm 40	60-120
Cholesterol (mg/dl)	150 \pm 10	180 \pm 20
Triglyceride (mg/dl)	60 \pm 15	110 \pm 20
Haematocrit (%)	35 \pm 9	37-47
RBC (/ mm ³)	4.0 \pm 1.4 x10 ⁶	4.2-5.4 x 10 ⁶

RBC: red blood cells

bone and joint abnormalities, decreased skin pigmentation, neurological abnormalities, hypogeusia and smell disorders (9). Therefore, low copper levels in patients with AN could be involved in a vicious circle, by impairing the sense of taste and hence facilitating the abstinence from food (3). Moreover, patients with AN could engage binge-eating or purging behavior (self-induced vomiting), possibly derived from taste or smell disorders as well.

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