BODY-WEIGHTS AND SERUM PROTEIN VALUES OF BANTU CHILDREN WITH PNEUMONIA

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For a number of years it has been our impression that most Bantu children admitted to hospital with bronchopneumonia are also malnourished. There is convincing evidence of a mutually aggravating effect between malnutrition and infection. The mortality rate from respiratory infection is also the case in kwashiorkor patients, and the values on admission and discharge did not differ significantly.

MATERIAL AND METHODS

During 1962 and 1963 nude body-weights and serum protein values were determined on a group of Bantu children with broncho-, lobar or lobular pneumonia admitted to a paediatric ward at the Pretoria General Hospital. Only cases in which the respiratory disease was of recent onset (of not more than a week's duration) were included in the series. Patients with concomitant kwashiorkor or tuberculosis and all who died after admission were excluded. The clinical diagnosis was verified by radiological examination of the chest.

Eighty-two patients conformed to the abovementioned criteria. There were 40 girls and 42 boys with an age range of 3 weeks to 9 years. The nude body-weights of all were recorded on admission and the serum protein values were determined in 57 of the 82 patients within 3 days of admission and repeated before discharge from hospital, 10-20 days after admission. The serum protein levels were estimated according to Reinhold's modification of the biuret method of Weichselbaum.

RESULTS

The serum protein values are given in Table I. The serum albumin values on admission (average 3-1 G/100 ml.) were found to differ significantly (P < 0.01%) from the values obtained on discharge (average 3.5 G/100 ml.) when the Wilcoxon matched-pairs signed-ranks test was applied.

The weights of the children are plotted against the Harvard 50th and 3rd percentile lines in Fig. 1. It can be seen that most of the values fall below the 3rd percentile line.

DISCUSSION

The mean serum albumin level of 3·1 G/100 ml. found in the present investigation falls within the range of 'marginal hypoaibuminaemia' (2.75-3.5 G/100 ml.), a term defined by Brock as a serum albumin level which can be increased by the feeding of an adequate and balanced protein mixture. Such a response actually occurred in most of the patients of the present series during their hospital stay, the mean serum albumin level at the time of their discharge being 3·5 G/100 ml.

The serum globulin values were in the normal range, as is also the case in kwashiorkor patients, and the values on admission and discharge did not differ significantly.

![Fig. 1. Weights of Bantu children with pneumonia plotted against the Harvard 50th and 3rd percentile lines.](image)

Although it is well known that infection may cause a negative nitrogen balance, it is unlikely that the pulmonary infection per se could have been responsible for the lowered serum albumin values. Serum albumin decreases only after a considerable loss of body protein and the patients studied all had a history of recent onset of disease. No low serum albumin values were found on admission in an investigation done on 15 adult Bantu patients with lobar pneumonia, the average serum albumin concentration being 4·2 G/100 ml.

The weights of only 5 of the 82 children fell on or above the 50th Harvard percentile lines (Fig. 1). The evaluation of the weights of the Bantu children according to norms for American children might seem unjustified, but we have adopted this empirical standard for several reasons, among them being the fact that Kahn and Freedman found no

| TABLE I. SERUM PROTEIN VALUES IN 57 BANTU CHILDREN WITH PNEUMONIA |
|--------------------------|--------------------------|--------------------------|
|                          | N            | Average value | Average value |
|                          | on admission | before discharge |              |
| Serum albumin G/100 ml.  | 57           | 3·1           | 3·5           |
| Serum globulin G/100 ml. | 57           | 3·3           | 3·2           |

Result of application of Wilcoxon matched-pairs signed-ranks test to initial and final values

|                          | Highly significant difference (P < 0.01%) |
|                          | Not significant                       |
In the heights and weights of well-nourished Bantu and American children. We therefore consider that the low weight scores on the Harvard percentile graph as well as the lowered serum albumin concentrations found on admission in most of the patients, are indicative of protein malnutrition.

The most likely explanation of this association between pneumonia and malnutrition is that their malnourished state predisposed these children to the development of pneumonia. During an investigation at Cape Town, Truswell et al. 15 concluded that protein malnutrition was an important factor in the aetiology of gastroenteritis in children. However, malnutrition is probably a prominent feature of the child population represented by our series (although the patients were an unselected group drawn from different areas and different ethnic groups over a period of 2 years), and it is therefore to be expected that malnutrition will be associated in some degree with any disease condition that might be investigated in this group of the population.

SUMMARY

The body-weights of 82 Bantu children with pneumonia were taken and the serum protein values of 57 of these determined. The weights of most patients fell below the 3rd Harvard percentile line and the average serum albumin concentrations were 3·1 G and 3·5 G/100 ml on admission and discharge respectively. It is concluded that the Bantu children with pneumonia were suffering from protein malnutrition on admission and that this had probably predisposed to the development of the disease.

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REFERENCES


HOOKWORM INFECTION AND IRON-DEFICIENCY ANAEMIA IN DURBAN

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Beaver 15 has recommended the selection of anaemic individuals as an initial step in hookworm disease case finding. However, it is depletion of the individual’s iron stores which determines the presence of anaemia, and the state of these stores is dependent on the balance between the degree of iron loss and iron gain from dietary sources. Consequently the development of iron-deficiency anaemia as the result of hookworm infection is determined not only by the duration and degree of parasitism, but also by the dietary intake and absorption of iron. Thus among Africans in Nigeria Gilles et al. 17 found only heavy hookworm loads produced significant anaemia in a population with a high dietary iron intake while among a predominantly Indian population in Mauritius, where a low iron intake is common, Stott 18 found comparatively light hookworm loads to be of importance.

In Durban the Indian community has a relatively low dietary iron intake, whereas the African diet has a high iron content. Since hookworm infection is common in both populations, and appears to be similar in degree, the opportunity is provided to study the relationship of hookworm infection to iron-deficiency anaemia in 2 communities living in the same area but with contrasting dietary iron intakes.

MATERIAL AND METHODS

Studies were done on consecutive admissions to a single medical unit at King Edward VIII Hospital, Durban—patients suffering from conditions culminating in a clinical blood loss or any gynaecological causes of excessive bleeding being excluded. Of a total of 200 patients, 52 were Indian females, 37 Indian males, 38 African females and 73 African males.

Three consecutive stool specimens were examined by Beaver’s technique 15 of counting helminth ova in a 1-2 mg. faecal smear. The degree of hookworm infection was assessed as follows: light infections—less than 5, moderate—5-20, and heavy infections—more than 20 eggs per preparation. All specimens were also examined by zinc sulphate flotation to reduce the possibility of missing minimal infections. All specimens were, in addition, tested for the presence of occult blood by the standard Gregersen slide technique.

Haemoglobin estimations were done on all these patients. When found to be 10 G/100 ml. or less, the mean corpuscular haemoglobin concentration (MCHC) was estimated and the bone marrow examined for the state of the iron stores. Iron-deficiency anaemia was diagnosed when there was a haemoglobin level of 10 G/100 ml. or less, an MCHC of 30% or less, and the bone marrow showed markedly reduced or absent iron deposits.

Twelve of the 14 patients who were found to have iron-deficiency anaemia and hookworm infection were treated with 5 G of bephenium hydroxynaphthoate and the stools collected for the following 72 hours. All hookworms from these specimens were collected and identified. Egg counts and occult