

SERUM IMMUNOGLOBULINS IN PROTEIN CALORIE MALNUTRITION

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It has long been recognised that a close pernicious relation exists between malnutrition and infection (Cicely Williams, 1953) Jelliffe et al (1954).

While common infections may not seriously affect the health of a well – nourished child, the same pathogenic organisms may cause serious complications in the malnourished. In a report of 152 cases of kwashiorkor and 46 cases of marasmus, infections, especially gastroenteritis, constituted significant precipitating factors (Hassan, 1967). It has been noticed that measles has a higher mortality in Africa than in Europe and U.S.A. owing to the co-existence of protein-calorie malnutrition (Henrickse, 1967, Morley, 1969).

1. The mechanism of interaction between malnutrition and infection has been more elucidated in experimental animals than in human beings. Dubos (1965) found that young mice maintained on protein deficient diest had a much higher susceptibility to various bacterial infections than mice maintained on a normal diet. In man there is little clear evidence to relate nutrition to resistance except in the case of tuberculosis, susceptibility to which appears to be increased when the nutritional states of the community is lowered. (Stewart, 1968) In our clinical experience in Khartoum, tuberculosis was more usually associated with general calorie deficiency (marasmus), than with protein deficiency (Kwashiorkor). Out of 194 cases of marasmus admitted during the preceding five years (1969–1973), there were 5 cases of Pulmonary tuberculosis (2.5%) while there was only 3 cases (1.3%) among 228 cases of kwashiorkor admitted during the same period.

In general both experimental research and clinical experience have indicate that protein calorie malnutrition increases susceptibility of the child to infections and adversely influence its effects. The mechanisms of these deleterious actions are not yet explained.

3. The immunoglobulins, which are synthesized by plasma cells, represent important host factors against infection. Three main classes of immunoglobulins (Ig M, Ig G and Ig A) and two minor components (Ig E and Ig D) are recognized, Deficiency of Ig M is often associated with susceptibility to septicaemia.

4. IgG immunoglobulins are more effective than IgM in neutralizing diph-

theria toxin, or virus such as poliovirus. In the rabbit it has been shown that IgM anti-Salmonella antibodies are some 500–1000 times more effective than IgM antibodies as opsonizing agents (Wein, 1971).

In this study 15 cases suffering from protein calorie malnutrition and infection and 5 other cases in the children wards, who were suffering from other disorders and infection were investigated for serum immunoglobulin factors IgG and IgM.

MATERIAL AND METHODS:

15 cases of protein calorie malnutrition were classified clinically as Kwashiorkor (5 cases), marasmus (5 cases) and marasmic Kwashiorkor (5 cases). Anthropometric measurements, radiography of chest, wrists and arms, serum proteins and liver function tests, mantoux tests, complete haemogram and blood smears, general stools examinations and urine analysis were carried out in all cases. Other tests such as urine and stools cultures or throat swabs for cultures were performed in indicated.

Venous blood samples were obtained from all these cases and from 5 other children who were admitted at the same time for similar kinds of infections, but who were not suffering from malnutrition. The sera were collected by Dr. C.C. Draper and examined in the Ross Institute of Tropical Hygiene, London, for immunoglobulins and malaria antibody.

RESULTS:

The anthropometric measurements are given in Table 1. The concentrations of serum proteins, and results of mantoux tests are shown in table 11. The values of IgG and IgM of all cases of protein-calorie malnutrition (Table 111) were compared to those from the control cases (Table IV) and the normal values of normal American children of similar age groups (Elliot Ellis and Charles Angust, 1970, Table V).

Since studies in the U.S.A. have demonstrated that induced malaria infections in adult volunteers caused major increases in IgM (Abele, D.C. et al, 1965), and that malaria infection in young African children in Gambia it was necessary to estimate serum titre in malaria (IFAT) against *P. falciparum* which is a common infection in this part of the country.

The values of the immunoglobulins G and M in all the types of protein-calorie deficiency are not only within normal ranges, but the concentrations of IgM are increased in 6 cases (60 per cent) 3 cases of kwashiorkor and 3 cases of marasmus, in one of which the Serum titre in malaria was significant.

DISCUSSION:

In this series of cases of protein calorie malnutrition and infection, no deficiency of IgG or IgM was detected. In fact the serum level of IgM was

found raised in 60 per cent of cases.

In a study of 11 cases suffering from kwashiorkor and infection in South Africa, Keet and Thom (1969) found no deficiency of IgG, IgA, or IgM. The age groups were similar in both series, but in this series, there were in addition to kwashiorkor, there were cases of marasmus and marasmic-kwashiorkor.

In this study, as in others done elsewhere, the immunoglobulins were estimated some time after the clinical manifestations of both protein-calorie malnutrition and infections have become apparent. It will be useful to assess the values before the onset of infection as well as after it and in the potential cases of malnutrition as well as in the normal children at the various age-groups. As IgA is manufactured by the plasma cells in the lamina propria of the mucous membranes, estimations of its concentrations in the intestinal secretions of cases of protein-calorie malnutrition will be quite significant.

SUMMARY

In an attempt to study one important aspect of the mechanisms of interaction between malnutrition and infection, the immunoglobulins IgM, IgG and serum titre in malaria were estimated in 15 cases of malnutrition who were suffering from different types of infections and in 5 other cases in the children wards who were suffering from infections, but who were not malnourished. No deficiency of IgG or IgM was detected. On the contrary the levels of IgM were higher than normal in 60 per cent of cases of Protein-calorie malnutrition.

REFERENCES

- Abele, D.C. ET Al (1965) American J. Trop. Med. Hyg., 14:191.
- Dubos, R.J. & Hirsch, J.G. (1965) Bacterial and Mycotic Infections of man, 4th. Hd. London Pitman Medical.
- Hassan, M.M. (1967) S.M.J. vol. 5 No. 4, 168.
- Hendrickse, R.G. (1967). Giba Foundation Study group No. 31. Nation and Infections P.98 Ed. Wolsternhalme, G.E.W. and O'Connor, M. Churchill, London.
- Keet, M.P. & Thom, H. (1969). Arch. Dis. Childh, 44, 600.
- McGregor, I.A. Et Al (1970) Clin. exp. Immunol.
- Morley, D.C. Et Al (1964) B.2 Med. J. 1. 667, 7:51.
- Scrimshaw, N.S. Et Al (1960) J. Trop. Pediat. 6 No. 2., 37.
- Stewart, F.S. (1968). Bacteriology & Immunology for Students of Medicine Bailliere.
- Weir. D.M. (1971). Immunology for undergraduates churchill livingstone. Edinburgh & London.
- W.H.O. Chronicle (1970) Nutrition, Vol 24, No. 12., 552.