

NUTRITIONAL MARASMUS IN BANTU INFANTS IN THE PRETORIA AREA PART I. AETIOLOGICAL FACTORS

P. J. PRETORIUS, M.MED. (PAED.), M.D., *National Nutrition Research Institute, CSIR and Department of Paediatrics, University of Pretoria*, AND H. NOVIS,* M.B., CH.B., *Department of Paediatrics, University of Pretoria*

The commonest nutritional diseases in Bantu children in the Pretoria area are kwashiorkor and nutritional marasmus. While kwashiorkor has been studied intensively in many parts of the world, including South Africa, much less attention has been given to nutritional marasmus.

The nutritional marasmus syndrome has not as yet been clearly defined. Many authors do not attempt to differentiate marasmus from kwashiorkor. However, we endorse the view¹ that the differences between the typical case of kwashiorkor and the typical case of marasmus are sufficiently clear to justify regarding the two conditions as separate entities.

The basic cause of kwashiorkor is an inadequate intake of good quality protein.^{2,3} It has been suggested that a relatively excessive intake of carbohydrate may also be an important factor.^{4,5} Nutritional marasmus, on the other hand, is apparently caused by a deficient intake of both calories and protein,^{4,6} the diet evidently being reasonably well balanced, but insufficient in quantity. This view is supported by results which have been obtained in experimental work on piglets.⁷

The present report is based on our experience with 80 patients with marasmus admitted to one of the Bantu children's wards of the Pretoria General Hospital during the period August 1961—February 1964. Only one criterion—severe wasting—was used for the diagnosis of marasmus. The body weights of all patients fell far below the third percentile line for normal American children.⁸ With the exception of 2 patients who had slight swelling of the dorsa of the feet, no oedema was detected in any of the cases.

Many of our patients showed evidence of infection on admission or gave a history of some infection preceding the onset of the disease. As in the experience of others,^{6,9,10} gastroenteritis and tuberculosis were in our series the most common associated conditions.

Roentgen photographs of the chest were made and tuberculin skin tests done as a routine procedure on all patients soon after admission. Active pulmonary tuberculosis was diagnosed in 9 (11%) of the 80 patients.

Serological tests for syphilis were also done, and evidence of congenital syphilis was obtained in 3 patients.

A. MARASMUS SECONDARY TO INFECTION AND OTHER CONDITIONS

Sixteen of the 80 patients in whom the wasting was probably secondary to conditions other than pure under-nutrition were excluded from the detailed study reported under 'primary nutritional marasmus'. Ten of these 16 patients showed evidence of active pulmonary tuberculosis, 3 had congenital syphilis, 2 suffered from renal disease (autopsy showed lower nephron nephrosis and bronchopneumonia in 1 patient and bilateral renal calculi with hydronephrosis in the other), and one patient had a congenital heart condition (autopsy not done).

B. PRIMARY NUTRITIONAL MARASMUS

The remaining 64 patients were studied with reference to certain aetiological, clinical and biochemical features of the disease. Nitrogen and fat-balance studies were carried out on some of the patients. The present report is concerned only with aetiological factors. The other aspects studied are to be dealt with in later reports.

1. Age and Sex

The mean age on admission was 8.7 months. In Table I the age distribution is compared with that of 205 patients with kwashiorkor reported previously.¹¹ It is apparent that

TABLE I. AGE DISTRIBUTION

Age (months)	Nutritional marasmus (64 patients)	Kwashiorkor (205 patients)
0-12	50 (78%)	26 (12.7%)
13-24	14 (22%)	138 (67.3%)
Over 24	0	41 (20%)

most of the marasmic patients fall into a younger age group than patients with kwashiorkor. Similar findings have been made by several other authors.^{6, 12, 13} The early onset of marasmus suggests that the disease tends to be associated with inadequate breast feeding and premature weaning, whereas kwashiorkor develops in children whose breast feeding was probably more adequate and more prolonged.

Thirty-eight (59.6%) of the patients were boys. The average age for boys was 7.5 months and 10.4 months for girls.

2. Diet

The dietary history was quite different from the history usually obtained in the case of kwashiorkor patients. Most kwashiorkor patients in our area receive milk irregularly if at all.¹¹ In the present series 7 patients were said never to have received any cow's milk. Ten patients were still being breast-fed, but only one mother thought that her milk supply was adequate. The others were all receiving cow's milk in some form. In more than half the cases dried milk was being used. Without exception the milk mixtures were being given either far too dilute or in insufficient quantity. The dietary picture seems therefore to be in keeping with the view that the basic cause of nutritional marasmus is the inadequate intake of a more or less balanced feed.

It was exceptional for a child to receive any other good-quality protein foodstuffs, vegetables or fruit. About half the patients, however, received cereal supplements usually consisting of maize-meal porridge.

3. The Socio-Economic Background

During the course of the investigation it soon became evident that, as in the case of kwashiorkor,^{11, 14} socio-economic factors, especially poverty and ignorance, were of great importance in bringing about nutritional marasmus.

30% of the fathers were either out of work or did not contribute to the care of their families. The mean income of those who were employed was R22.70 per month. 17%

*Present address: 109 S. Elmwood Ave., Oak Park, Illinois, USA.

of the mothers also worked. They were employed as domestic servants earning R3 - R14 per month. In 18% of cases the patients' relatives, usually the grandparents, were responsible for the care of the children.

34% of the mothers were unmarried. The average number of living children was 3.2 per mother, but many mothers had lost one or more children.

67% of the patients came from Bantu townships on the outskirts of Pretoria. Most of the remainder came from farms.

4. The Role of Infection

The precipitation of kwashiorkor by various infections is well recognized.¹⁵ An association between marasmus and various types of infection has also been frequently observed.^{6, 9, 10, 16} Cases of tuberculosis and congenital syphilis have been excluded from the series under discussion.

Infection of the Respiratory System

Otitis media was common, and a purulent discharge from one or both ears was present on admission or developed soon afterwards in 17% of the patients. Radiological evidence of pneumonia was obtained on admission in 6 patients (9.4%). Coughing was a prominent symptom, while rhonchi and/or crepitations were detected in about one-third of the patients. In 11 of the 22 patients who died, bronchopneumonia was thought to be the main cause of death. A history of an attack of measles, shortly before admission, was obtained in 2 patients.

Gastro-intestinal Infections

(a) *Diarrhoea.* A history of diarrhoea was obtained in 64% of the patients.

(b) *Stool weights.* Since the history of diarrhoea was undoubtedly not accurate in all cases, the wet weight values of the stools collected during balance studies carried out on some of the patients were recorded. A collection was made within the first 2 weeks after admission in 18 patients and repeated after an interval of at least 2 weeks. The mean values of 179 G and 103 G respectively were obtained during the 2 test periods. The corresponding mean values obtained in 31 kwashiorkor patients were 204 G and 81 G respectively.¹⁷ These findings support our impression that diarrhoea is common in marasmic infants.

(c) *Microscopic examination.* The faeces of 47 patients were examined microscopically. Mucus and pus were present in only 4 specimens. *Giardia lamblia* cysts were detected in one specimen. Helminthic infestation did not appear to have played a part in the development of the marasmus in our cases, since ova were in no case detected in the stools. A history of helminthic infestation (ascariasis in one patient and a double infestation with ascaris and taenia in another) was given by 2 mothers.

(d) *Pathogenic organisms.* Rectal swabs taken from 55 patients were cultured for shigella and salmonella organisms. In 4 cases a shigella was isolated and a salmonella was cultured from a further 4 patients. Infective diarrhoea caused by these organisms does not, therefore, seem to be of great aetiological importance in our cases. The incidence of infection caused by pathogenic strains of *E. coli* was not investigated. Infective diarrhoea caused by these strains seems to be of importance in other centres,^{9, 16} and some of these strains have been frequently isolated from

infants with gastroenteritis in the Pretoria area.¹⁸ These organisms may therefore be of aetiological significance in a proportion of patients with marasmus.

Infection of the Urinary Tract

The urine of 45 patients was tested for albumin and the sediment examined microscopically after centrifugation. Albuminuria, found in 11 (24%) of the patients, seems to occur less frequently than in kwashiorkor, where the incidence has been found to be as high as 40%.¹¹ With 2 exceptions, never more than a trace of albumin was found. Pus cells, usually from 2 - 15 per high-power field, were found in 31% and *E. coli* was cultured from the urines of 17% of the 45 patients. Uncontaminated specimens of urine are difficult to obtain from infants, but it seems nevertheless from these findings that urinary infections occur fairly frequently in marasmic infants. Whether urinary infection is of any importance in the aetiology of marasmus is, however, uncertain.

SUMMARY

Certain aetiological factors were studied in 80 patients with marasmus.

In 16 patients the condition was probably secondary, at least in part, to factors other than undernutrition. Ten of these patients showed evidence of active pulmonary tuberculosis, 3 had congenital syphilis, 2 suffered from organic renal disease and one from a congenital heart condition.

64 patients were regarded as having nutritional marasmus. These patients belonged to a younger age group (mean age 8.7 months) than patients with kwashiorkor.

The most important aetiological factor appeared to be either an inadequate intake of cow's or mother's milk, or the use of excessively dilute cow's milk mixtures. Various brands of dried milk were used in more than half the patients. Almost without exception the amounts of dried milk used for reconstituting the milk were ridiculously small. This was apparently the most important single circumstance leading to undernutrition in the present series.

As in the case of kwashiorkor, underlying socio-economic factors, particularly poverty and ignorance, appeared to be of great importance in the development of nutritional marasmus.

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