

Incidence and Spectrum of Malnutrition in Paediatric Hospital Wards

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SUMMARY

The incidence and type of malnutrition in a Johannesburg hospital for Blacks were studied in 1 567 paediatric medical inpatients under the age of 10 years. Fifty-eight per cent were significantly malnourished. The highest incidence (80%) occurred between 7 months and 2 years of age—with a mortality double that of better-nourished children. Gastro-enteritis contributed greatly to morbidity and mortality. Only 9% of children reached or exceeded the 50th percentile for weight. Despite unsatisfactory socio-economic conditions, this heavy load of avoidable illness and death might be alleviated by more co-ordinated use of available agencies for health promotion.

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Many articles have been published on various aspects of malnutrition as seen at Baragwanath Hospital,¹⁻³ but the extent and gravity of the problem in relation to the total patient load in the paediatric wards have not been highlighted before.

The hospital serves a major part of the Black population employed in Johannesburg and its surrounding industrial complexes. Socio-economic circumstances are poor, and the full-time employment of both parents is common. In addition, the illegitimacy rate is very high in this community. Many children are perforce separated from their mothers at an early age and receive inadequate care.

Avoidable morbidity and mortality make heavy demands on the hospital services, and in the young, preventable infections and malnutrition constitute a large part of this load. To determine more accurately the contribution made by nutritional deprivation, a retrospective study was undertaken to establish the incidence, the type of malnutrition and the associated mortality seen in children admitted to Baragwanath Hospital during one year.

PATIENTS AND METHODS

Case records of all children admitted to the paediatric medical wards on alternate days during the year 1970 were reviewed. This gave an unselected sample of approximately 50% of these patients, and totalled 1 686 cases. The age range was from birth to 10 years. Since in 37

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children the weights were unknown, and since 82 infants admitted in the first month of life were likely to have been of low birthweight, these patients were excluded. Thus the nutritional status of only 1 567 children could be assessed. Harvard curves,⁴ as accepted for all population groups,⁵ were used and malnutrition was diagnosed when the child's weight fell below the 3rd percentile for age and sex. The malnourished patients were subdivided into 4 groups according to the Wellcome criteria.⁶

The association of diarrhoea with malnutrition was studied. As diarrhoea is such a frequent sign, only patients who developed dehydration sufficient to require intravenous therapy have been included.

RESULTS

The comprehensive findings of the study are shown in Table I. Of the 1 567 patients, 902 (58%) were below the 3rd percentile for weight.

Fig. 1 shows the general nutritional status related to age—23% of 160 infants of probably normal birthweight had already fallen below the 3rd percentile in their first month of life. The peak incidence of malnutrition (almost 80%) occurred in patients between the ages of 1 and 2 years.

Percentage mortality is also depicted in Fig. 1. Most deaths occurred before the second birthday. The death rate of neonates (approximately 20%) was similar in the two nutritional groups. Between the ages of 7 months and 1 year just over 20% of the malnourished group died, a percentage double that found in those with weights above the 3rd percentile. This trend continued, and between 2 and 5 years the mortality rate in the better-nourished children was one-third of that in the undernourished.

The distribution of the various types of nutritional deviation according to the Wellcome criteria in the 902 undernourished patients is shown in Fig. 2. Obvious evidence of protein energy malnutrition (PEM) occurred in 50%, while the other 50% were below the 3rd percentile for weight only.

The left-hand graph in Fig. 3 shows the various types of malnutrition as a percentage of the number below the 3rd percentile in each age group. The highest incidence of marasmus (45%) occurred in the first 6 months of life, declining with age, but still occurring in 15-20% of patients up to the age of 10 years. Malnutrition with oedema occurred at all ages after 1 month, but maximally between 1 and 5 years. Simple underweight was common (40-60%) in all age groups (Table I).

TABLE 1. DETAILS OF AGE INCIDENCE, CASE MORTALITY AND DISTRIBUTION OF TYPES OF MALNUTRITION

Age	Type of malnutrition											
	Without oedema			With oedema								
	Weight above 3rd percentile	Weight below 3rd percentile	Underweight	Marasmus	Kwashiorkor	Marasmic kwashiorkor						
Total	Deaths	Total	Deaths	Total	Deaths	Total	Deaths					
Total series	1 567	208	902	141	452	64	244	39	146	26	60	12
0-1 mo. ...	160	29	36	5	14	4	22	1	0	0	0	0
1-6 mo. ...	369	53	201	31	98	11	90	17	8	0	5	3
7-12 mo. ...	272	48	193	39	111	23	48	8	25	5	9	3
13 mo.-2 yrs ...	309	48	232	43	109	19	38	6	60	12	25	6
2-5 yrs ...	287	22	162	19	80	7	27	4	40	8	15	0
6-10 yrs ...	170	8	78	4	40	0	19	3	13	1	6	0

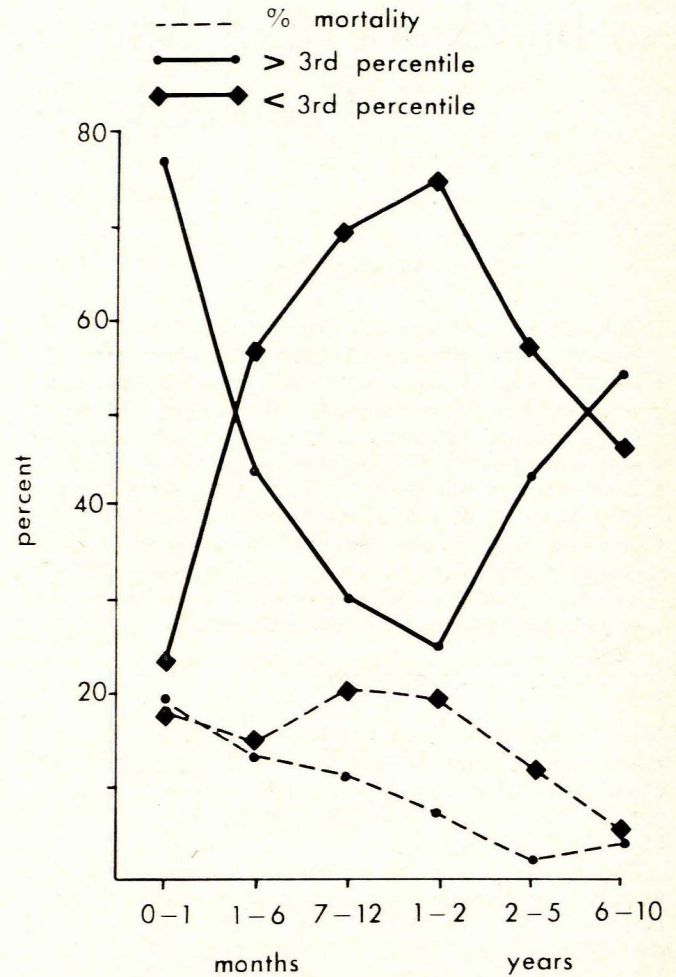


Fig. 1. Comparative percentage incidence and mortality of two different nutritional groups related to age.

The right-hand graph in Fig. 3 depicts mortality in the different nutritional groups. Of babies under 6 months with marasmic kwashiorkor 60% died. In the other malnutrition subgroups approximately 20% of all patients under the age of 5 years died.

The apparent preponderance of males in the whole series, particularly in the malnourished groups, was not statistically significant.

More than a quarter (426) of the patients admitted required intravenous therapy for dehydration. Table II shows that 38% of the undernourished children were significantly dehydrated, compared with 13% of the better-nourished. It can also be seen that of the 88 well-nourished infants only 14 (17%) died, while 25% of the malnourished children with gastro-enteritis succumbed.

The age distribution and mortality of gastro-enteritis are depicted in percentages in Fig. 4. The peak incidence occurred between birth and 6 months, then there was a steady decline with increasing age. The death rate, though

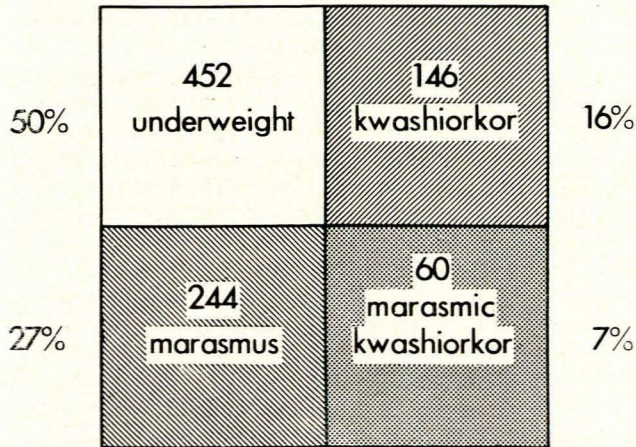
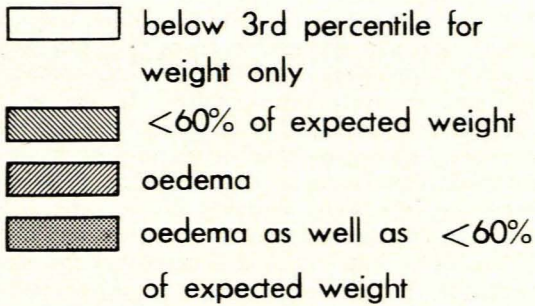


Fig. 2. Distribution of the four types of malnutrition in 902 patients (Wellcome criteria).

TABLE II. INCIDENCE OF AND DEATHS ASSOCIATED WITH GASTRO-ENTERITIS IN THE VARIOUS NUTRITIONAL GROUPS

Nutritional group	Total	Number with gastro-enteritis	Deaths assoc. with gastro-enteritis
Weight > 3rd percentile	665	88 (13%)	14 (17%)
Weight < 3rd percentile	902	338 (38%)	81 (24%)
Underweight	452	145 (32%)	27 (18%)
Marasmus	244	116 (47%)	24 (20%)
Kwashiorkor	146	40 (29%)	13 (32%)
Marasmic kwashiorkor	60	38 (63%)	17 (45%)

higher in the very young, did not diminish as dramatically in the older infants. In the first month of life and after the first birthday there were no deaths associated with gastro-enteritis in the better-nourished group of infants.

Dehydration had its highest incidence (63%) and mortality (45%) in patients with marasmic kwashiorkor, and 32% of those with pure kwashiorkor and gastro-enteritis died.

A very small number of all the children reviewed reached or exceeded the 50th percentile for weight. The mean percentage of the total series was 9% (144 children), with a maximum of 16% in the first month of life and a drop to 4% between 1 and 2 years. The percentage of deaths was as high in this group as in those below the 3rd percentile, namely 16% (24 children).

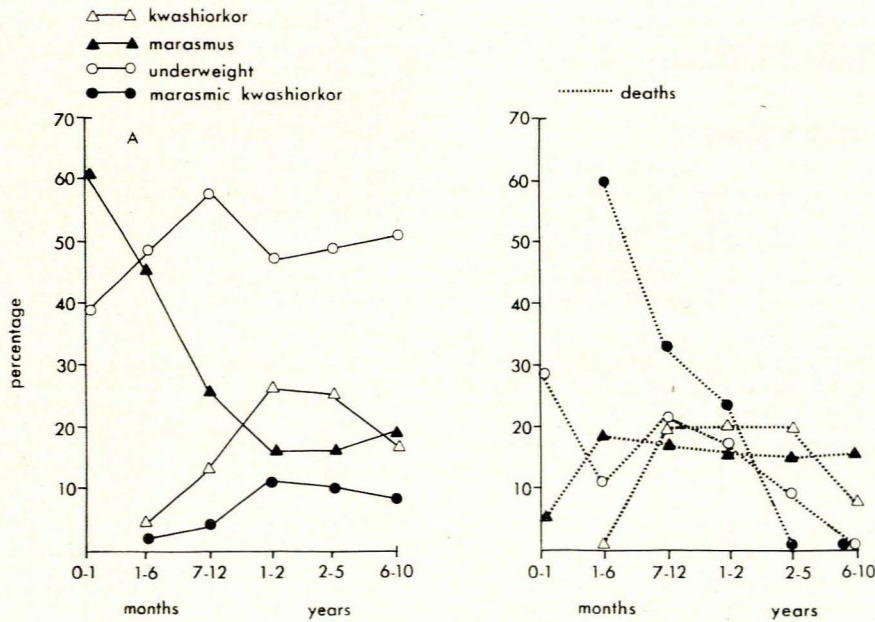


Fig. 3. Left: Percentage of each type of malnutrition among children below the 3rd percentile in different age groups. Right: Percentage mortality of each type of malnutrition in different age groups.

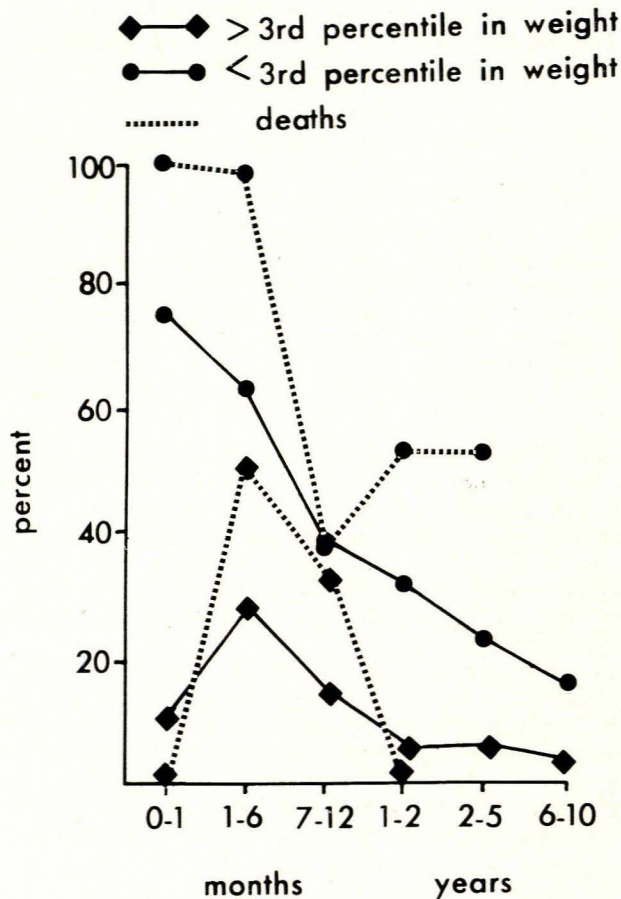


Fig. 4. Percentage incidence of gastro-enteritis and percentage deaths in dehydrated infants above and below the 3rd percentile in weight in different age groups.

DISCUSSION

The figures presented are not very different from those discussed by Wayburne³ in 1968, and indicate that a seriously deprived population group continues to live in the environs of the hospital. The well-recognised association between malnutrition and infection necessitating medical attention is evident.^{7,8}

The onset of malnutrition from the first month of life was noted, with a peak incidence in the second year. The latter age group constitute the majority of paediatric inpatients. Early nutritional deficiency in Johannesburg has previously been recorded,³ but the problem persists through the pre-school years.

The mortality rate in the undernourished exceeds that in patients whose weights are above the 3rd percentile at all ages except in the neonatal period. This presumably reflects the vulnerability of the newborn to less avoidable disorders.

The combination of gastro-enteritis with malnutrition resulted in increased mortality, which was directly related to the severity of the nutritional deficiency.

The over-all death rate among malnourished patients has not changed appreciably since the introduction of potassium supplements in 1951,¹⁻³ and is comparable to that found in many other centres.⁷ In the series from Baragwanath Hospital between 1963 and 1966³ the death rate was a little higher than in the present group, but in the former most patients with moderate PEM were excluded. The high ward mortality in our series is not surprising, considering that only the most severely ill children are admitted,³ while many are treated in the short-term rehydration unit and in the outpatient department.

This mortality rate continues in malnourished children over the age of 1 year, whereas the less deprived children show a steady decline in death rate.

It was striking that only a very small number of patients reached or exceeded the 50th percentile for weight. It appeared that this 'elite' group was admitted for diseases of a different type, such as bronchiolitis, poisoning and hypertonic dehydration. The high percentage of deaths in this well-nourished group was disturbing, but again illustrates the severity of the disease state of those qualifying for inpatient care.

The total population of the area served by the hospital is estimated to be above 1 million, and, though our figures cannot be extrapolated to the child population as a whole, the high incidence of malnutrition seen in the hospital must be a reflection of a serious malnutrition problem in at least the young of the community.

Studies elsewhere^{7,9} have shown that the hospital patient mortality poorly reflects the true death rate of these malnourished children, many of whom subsequently die without readmission to hospital. Much of this problem could be alleviated even before the necessary improvement in socio-economic circumstances is undertaken, by relatively simple educative measures and by the establishment of pre-school clinics and nutritional rehabilitation centres near the patients' homes. This has been shown elsewhere to be far more economical and effective than treating children in teaching-hospital wards.^{7,10}

In view of the true concern of many people already working in this area, an effort towards co-ordination ought to be able to achieve more than is at present being done.

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