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WASTING IN INFANCY*

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The subject of wasting in infancy is so vast that the approach to it, and the direction of thought for considering it at a meeting of this kind, is not very easy. When one refers to the literature, one becomes quite bewildered by its extensiveness and the variety and conflict of opinions expressed by the various authorities. An enormous number of most valuable observations and investigations on nutritional disturbances have been carried out at home and abroad by a host of workers, and yet it seems impossible to arrive at any definite conclusion with regard to many of the problems. I can only attempt to offer a brief and general outline, which I hope will serve as a basis for discussion.

By the term "wasting" I take it that we mean a condition of malnutrition of the infant from any cause, and in this connexion the two chief factors usually concerned are the body weight and growth, but in the case of the infant we are perhaps inclined rather to disregard the growth or length, and to focus our attention on the weight of the child. Therefore we meet to-day to consider those conditions which cause failure to gain weight, or in some cases cause actual loss of weight in infancy. In most cases the child is born healthy, and its subsequent failure to develop along normal lines may be due to a variety of causes, of which the most important appear to come under the following headings:

1. Dietetic Errors:

- (a) Food unsuitable in quantity or quality, or both.
- (b) Mismanagement of the way in which the food is given to the child.
- (c) Disability of the child to take the food given to it.

2. Infection:

- (a) Gastro-intestinal.
- (b) Parenteral.

3. Environment:

Bad hygiene, including poor social conditions and lack of "mothercraft."

4. Constitutional Causes:

- (a) Congenital disease.
- (b) Exudative or other diatheses.
- (c) Neuropathic defects.

5. Birth Injuries.

6. Prematurity.

7. Marasmus or "Infantile Atrophy."

(Since marasmus *per se* does not appear to fall strictly under the above headings I have classed this by itself for special consideration.)

Time does not permit of dealing in any detail with all the different types of cases which occur under the headings that I have suggested, but perhaps I may be permitted to refer very briefly to some of them.

Dietetic Errors

From a general point of view failure to thrive is due to a lack of proper co-ordination between the nature of the food and the ability of the child to digest and assimilate it. The degree of ability or disability of the child to receive and digest its food has been referred to by Finkelstein as the "food tolerance," which varies according to the individual digestive capacity of the child. Dietetic errors, either in quantity or quality, are the most common cause of digestive disturbances, which may lead to varying degrees of malnutrition.

Most healthy infants have a wide digestive margin, and appear to be able to escape injury even when given feeding mixtures which might be considered unsuitable. Each infant has its own limitations in respect of its tolerance for unsuitable food, but when this is pushed too far, digestive disturbances are liable to arise resulting in varying degrees of nutritional deficiency.

I think most of you will agree that nutritional defects are much less common in the breast-fed baby, but you will also admit that difficulties and failures resulting in wasting conditions of the child occur far too frequently with this type of case. It is in the bottle-fed child, or the child who has been weaned too soon from the breast, that "wasting" or nutritional defects are most commonly found. I have had the advantage of seeing large numbers of these two classes of cases over a considerable period, and it may be of interest if I give you a few statistics taken from the records of the Mothercraft Society of cases admitted and treated there during the past five years. I have picked out the infants who showed the most excessive malnutrition, and have arranged them in the two following groups:

GROUP I: BREAST-FED

Apparent Causes of Wasting

Underfeeding	...	31
Early weaning	...	13
Overfeeding	...	5
Condition of breasts	4 (deformities of nipple)	
Condition of mother	1 (severe post-partum haemorrhage)	
Condition of baby	1 (difficulty in sucking)	
High-fat milk	...	3
Total	...	58

GROUP II: BOTTLE-FED

Apparent Causes of Wasting

Early weaning and wrong feeding	...	...	...	122
Never breast-fed and wrong feeding	...	...	...	20
Over- or under-feeding	...	...	...	3
Rumination	...	...	...	1
Baby's condition at birth	...	...	...	1
Infectious disease	...	...	...	1
Baby (mental defect)	...	...	...	2
Congenital heart	...	...	...	1
Eczema	...	...	...	1
Total	...	...	...	152

(Fifty-six of these infants were given breast milk from a foster-mother.)

* Read in opening a discussion in the Section of Diseases of Children at the Annual Meeting of the British Medical Association, Oxford, 1936.

ANALYSIS OF THE TWO GROUPS

	Group I: <i>Breast-fed</i>	Group II: <i>Bottle-fed</i>
Number of cases	58	152
Average age on admission	5.3 weeks	3.6 months
Average weight on admission	6 lb.	8 lb.
Average stay in hospital	32.3 days	82.3 days
Shortest stay in hospital	5 "	21 "
Longest stay in hospital	85 "	189 "
Mortality	Nil	6.5 per cent.

A comparison of the figures in these two groups of cases brings out certain facts. In the breast-fed group the number of severe malnutrition cases is much smaller, the average stay in hospital is much shorter, and the mortality is *nil*. The chief difficulty in this group was an insufficient amount of breast milk. In the bottle-fed group the total number is much larger, the average stay in hospital is very much longer, and the mortality rate is 6.5 per cent. By far the most common cause of the trouble was early weaning followed by unsuitable feeding.

Speaking generally, with regard to the breast-fed infant probably over-feeding is the most common mistake made, at least that is so in my experience, but this is seldom the cause of severe malnutrition, and the amount of the feeds can be readily adjusted. In the case of under-feeding it is rather surprising to note how many mothers are slow to realize that when the baby fails to thrive on the breast it is due to a deficiency in the amount of the milk. The value of accurate test-weighing cannot be overestimated when it is necessary to ascertain the amount of breast milk taken by the child.

Unsuitability of Breast Milk?

Although breast milk is undoubtedly unsuitable in some cases, it is unusual. The quality of the milk is blamed when the real trouble is due to its quantity or the way in which it is given. Analyses of breast milk prove that its composition is extraordinarily stable, and if any of its constituents vary the one most likely to do so is the fat. The fat may be raised to 6 or 7 per cent., and when this is the case it is liable to cause considerable upset in the child. The excess of fat in the mother's milk does not appear to have any direct relation to her diet, but an increased amount of physical exercise may help to reduce it in some cases. Conditions of the breast such as deformities, or soreness of the nipples, breast abscess, etc., are all responsible for premature weaning.

I think it may be fairly said that most of the failures to breast-feed, and the consequent nutritional defects in the child, are due to mismanagement, and are preventable if a proper technique is adopted. The mother very often has no experience, and is sometimes dissuaded from feeding her child when instinctively she is most anxious to do so. There are very few occasions when advice against breast-feeding is really justified, and it is quite evident that the number of cases of infantile malnutrition will continue to diminish as breast-feeding is increased.

Ante-natal preparation with regard to the future care and feeding of the child is of the utmost value. I think more might be done in this direction by the ante-natal clinics. The diet during pregnancy is a matter which seems rather to be neglected. After the arrival of the baby the maternity nurse must get breast-feeding properly established, and later the main function of an infant welfare centre should be to keep the child on the breast. The mother turns to her doctor or her nurse to instruct her in proper methods, and a knowledge of these methods must be acquired. Most of the medical schools and maternity hospitals now give special attention to the teaching of breast-feeding, and this should have an important effect in the future on the nutrition of the child.

One most striking thing is the satisfaction in the state of the mother who has been able to re-establish breast-feeding satisfactorily after having weaned her child, often

much to its disadvantage. With the difficulties which may occur in connexion with breast-feeding I have no time to deal, but I do wish to stress the fact that the lack of it is one of the most important causes of faulty nutrition, and very often of wasting in the child.

The Bottle-fed Child

Referring to the particulars of the severely wasted infants in the list to which I have referred, the chief cause of the malnutrition was unsuitable food, either given from birth or after weaning from the breast. In many cases a number of different foods had been used one after another, sometimes with temporary success and then further loss in weight. Wrongly balanced diets, and foods too much or too little in quantity for the caloric needs, were often used. Excess of fat, or an intolerance for fat, is a fairly common difficulty with the bottle-fed child, and when fat has to be much reduced or omitted from the feeds the caloric value drops considerably unless it is made up for by increased sugar or protein.

The views on the artificial feeding of the infant are varied, but I think that most people will agree that a properly balanced diet is necessary, that it should approximate the human standard, and that the caloric value of the food should be adequate to meet the child's requirements. I have seen many cases where a simple correction of the diet which is already being given to meet these standards has terminated the digestive difficulty. The subject of the amount of protein in the child's diet is one which interests me, and the tendency nowadays is to give milk mixtures which yield a much higher amount of protein than is present in breast milk. The optimum amount of cow's milk protein for the normal child is not certain, but at any rate in my own experience for the first six months a percentage of 1.6—that is, half-strength cow's milk—otherwise properly modified by the addition of sugar and fat, appears to give perfectly satisfactory results as judged by the child's state of nutrition, provided, of course, that a sufficient total is given.

The re-education of the child's digestive system after a severe upset may take a considerable time, and it is impossible to force food on it even when recourse is had to the use of breast milk from a foster-mother. In the case of the wasted child the aim should be to feed it up to the expected weight, and this means giving a larger number of calories for each pound of body weight than in the case of the normal child. The difficulty now arises in getting the child to deal with the amount of food which it really needs, and in such cases highly concentrated milk mixtures yielding small bulk are sometimes successfully used when the child can manage to digest and absorb them, but I have come across many cases where this is not possible, and the giving of the concentrated food simply aggravates the intestinal irritation. On the other hand, I have seen many successful cases in which it has been necessary to start the child on small low-calorie feeds, working gradually up to its maximum point of absorption. It is better to give a small amount of food which is absorbed than to give large amounts which are not made use of and sometimes tend to aggravate the condition. It is again all a question of tolerance of the child, and in some cases high-calorie feeds are of benefit, in others not so. For the child who has simply been starved the stronger feeds are certainly indicated, and are usually well tolerated. While on the question of caloric requirements it is of interest to note that the breast-fed child will sometimes gain excessively in weight in spite of the fact that it is receiving an amount of milk of much lower caloric value than its age and weight demand. Disability on the part of the child to take food may be due to local conditions of the mouth, nasal obstruction, nervous excitability, or to general weakness.

These call for appropriate treatment, otherwise the child who is difficult at the breast or bottle can usually be persuaded by an experienced nurse.

Infection and Environment

Gastro-intestinal infection may be conveyed by milk or by dirty bottles, teats, or "dummies"; stomatitis may give rise to an intestinal infection, therefore the mouth should always be examined. Gastro-enteritis due to any specific organism rarely occurs in infancy, and bacteriological investigation of the stools seldom yields any useful results. "Epidemic diarrhoea" has very much diminished of late in this country.

Parenteral infections, particularly middle-ear or mastoid disease, pyelitis, or pneumonic infections are sometimes associated with acute gastro-enteritis; these infections may be primary to, or the result of, the intestinal conditions. It is important to examine carefully every child who is suffering from prolonged wasting for possible infections of this type.

Among the children of the poor, perhaps lack of fresh air and bad housing conditions are more frequent than lack of food. Lack of mothercraft is also important, but the infant welfare movement and better social conditions of life are doing much to remedy these causes of malnutrition.

Constitutional Causes, Birth Injuries, and Prematurity

Congenital disease—that is, congenital syphilis, heart disease and neuropathic defects—and tuberculous infection (usually acquired) form a comparatively small group, and must be dealt with according to the special circumstances of the case. Intracranial and facial nerve injuries may cause malnutrition by interference with the sucking mechanism of the child.

The premature baby, although being under weight as compared with the normal child, does not necessarily suffer from malnutrition, but this condition is more likely to arise in the premature child owing to the enfeebled state of its digestive system. Hence special precautions must be taken in the feeding and management of the premature infant to guard it against wasting conditions.

Marasmus

The term "marasmus" is perhaps used somewhat loosely to apply to any case of prolonged and excessive wasting in infancy. Personally I regard the special feature of marasmus as being the wasted condition which results essentially from more or less complete non-absorption of food for no very obvious reason. This failure to absorb persists for some time, even when food is given in the most easily digestible form. The marasmic child wastes progressively, passes large undigested stools, and its general state of vitality is considerably lowered, rendering it liable to infections. Marasmus is seldom seen in the breast-fed child, which suggests that the kind of food is an important factor. Many marasmic infants can only be saved by supplying them with breast milk, and it is not always easy to get it. We have an organized service of blood donors under the Red Cross; it is to be regretted that we cannot have some form of organized service for the supply of breast milk in this country, as obtains, I believe, in America.

Any of the causes to which I have referred may be contributory factors in the marasmic state, and when it occurs it sooner or later leads to a state of dehydration followed by toxæmia. Moro regards the dehydration as the result of, and not as the cause of, the intoxication. Other workers think it may be due to the presence of

bacteria and their toxins in the bowel owing to abnormal conditions. Marriott refers to diminished blood volume and blood flow in the tissues in severe nutritional disturbances. Whatever may be the cause or causes of marasmus, it is very evident that the toxic condition and dehydration call for very urgent treatment. The mere replacement of tissue fluids by the simple method of subcutaneous injection of a solution of saline and glucose is often the means of saving a child's life.

Blood transfusion also appears to have beneficial effect, but this may be a difficult or even impossible procedure in the case of a wasted infant except by one who is specially practised in it. I have lately been trying the effect of giving intramuscular injections of whole blood, 20 to 40 c.cm., in some of these marasmic infants, particularly when toxæmia seemed to be a marked feature. So far the results are encouraging, since without any alteration in the feeding or management, the child has taken a turn for the better after receiving the blood. This method has the advantage of being exceedingly simple; no blood grouping is necessary, and no adverse reactions occur. It would be necessary to treat a number of cases in this manner before one could say that it had any definite result, but I feel that it is worth further trial.

Of the many other methods employed in the treatment of the marasmic child I have no time to speak, but in reference to the kind of food when breast milk is not available, lactic acid milk with a high protein and sugar content and low fat appears to be one of the most useful substitutes.

Conclusion

Viewing it from its narrowest limits, "wasting" in infancy appears to be due to two main causes: (1) errors of diet; (2) pathological conditions—that is, infection or disease. In opening this discussion I am fully aware of my shortcomings, but I hope I have succeeded in throwing out a few general suggestions which may encourage others to express their opinions on this very important subject.

O. L. Lien (*Tidsskr. f. d. Norske Lægefor.*, May 11th, p. 540) gives an account of investigations conducted among school children in a rural community in Norway. In the spring of 1935 as many as 502 out of 551 children examined were found to have one or more carious teeth. There were twenty-three with stopped teeth, and only twenty-six, or 4.7 per cent. of the total, with apparently healthy teeth. After noting that similar investigations in other parts of Norway have yielded even worse results, the author summarizes the findings of a dietetic questionnaire he addressed to 600 school children in the autumn of 1935. Of the 592 who replied thirty-four stated that they did not drink milk and forty-seven that they drank it only when they could get it. In other words, about 14 per cent. were practically without milk. On the other hand, there were as many as 381 (64 per cent.) who were in the habit of drinking coffee. With Norway heading the nations as the greatest consumer of coffee (seven kilos per head per year) and as the most afflicted by caries, the author suggests that these two unenviable championships are related to each other, and that addiction to coffee in childhood implies weaning from milk. As great a proportion as 63 per cent. of the children questioned ate bread of finely sifted flour or some nameless substitute for whole-meal bread. The author concludes with an appreciative reference to the educative value (for the recipients as well as for the emissaries) of dietetic questionnaires, and he suggests that were his example to be followed throughout the country a valuable impetus would be given to parents to indulge in some searching of heart for the benefit of their offspring.