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CONTRIBUTION TO THE ETIOLOGY OF RICKETS

By JOHN H. MORGAN, F.R.C.S.

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IN the debate which took place at the Pathological Society last year on Rickets, it was regretted by the President, Mr. Jonathan Hutchinson, that more pathological evidence had not been produced, and he proceeded to inquire why rickets should not be included with gout, etc., among the "diet diatheses." In a very able speech which followed, Dr. Baxter related the results of an investigation of upwards of a hundred cases of rickets, with especial reference to the age and health of the parents, the number of previous children, and their health, the hygienic surroundings, and the nature and quantity of food administered since birth. I need not prolong this paper by quoting the results of Dr. Baxter's investigation, which are fully reported in the recent volume of the *Pathological Society's Transactions*, but will state the result of an independent inquiry which was conducted at about the same time.

Between July, 1878, and April, 1879, I investigated 150 consecutive cases of rickets which were brought to my out-patient room at the Hospital for Sick Children.

The first question inquired into was the age at which the patients were brought under notice, and although this failed to prove anything definite as to the onset of the disease, it showed the period at which those manifestations of the disease which are most evidenced by the condition of the bones became so evident to the parents as to induce them to bring the child under the notice of a surgeon. An analysis of the ages of these 150 cases shows that the average date of their being brought to me was 33·8 months. The youngest of them was nine months, the eldest eleven years.

Inquiry was next made as to the place which the patient took in the number of the family, and my statistics on this point are curiously coincident with those of Dr. Baxter. In reckoning this table a miscarriage was counted as a previous child.

21·5	per cent.	were	firstborn.
17·7	„	„	„	„	„	second children.
17	„	„	„	„	„	third „
14	„	„	„	„	„	fourth „
3·7	„	„	„	„	„	fifth „
8·8	„	„	„	„	„	sixth „
4·8	„	„	„	„	„	seventh „
3·7	„	„	„	„	„	eighth „
2	„	„	„	„	„	ninth „
2·9	„	„	„	„	„	tenth „
1·5	„	„	„	„	„	eleventh „
2	„	„	„	„	„	twelfth „

An attempt was made, by inquiring into the locality in which the parents lived, to ascertain something of the hygienic surroundings in which the child had been nurtured; but beyond showing that cases were brought from all parts of London and its surroundings, nothing definite was ascertainable on this score.

A more satisfactory inquiry was made as to the income of the parents, and by contrasting this with the number of the household, and the presumable outlay for their maintenance, after deducting rent and other necessary expenses, an analysis of the circumstances of each case was possible. By this I found that more than half of the 150 cases came under the heading of "very poor," and among these it might be supposed that the nourishment given to a young child would be scanty in quantity and inferior in quality. The second class of "poor," or those who were better off than the last, but in far from good circumstances, included almost the remainder of my cases; only five coming under the heading of "fair circumstances," the best of the three classes.

I next attempted to divide the cases into classes according to the severity of their symptoms. In the earlier cases that were inquired into, the viscera were carefully examined, but I found that enlargement of the spleen was not by any means constant, and when present did not bear any relation to the external and more palpable symptoms. Enlargement of the liver was still more rare, and its relation to the severity of the cases even more indefinite.

Class I. included those early cases in which the aspect was fairly healthy, and the epiphysial ends of the bones were only slightly enlarged, or where the most evident symptom was some curving of the bones of the legs.

Class II. comprised those in which there was enlargement of the epiphyses of the ribs, the radii, tibiæ, and other bones, with the large abdomen, unhealthy aspect, inability to walk, and late dentition; also those cases where the disease was shown mainly by weakness of the ligaments, especially of the spine and of the knees.

Class III. included those in which the disease was well marked and advanced in all the bones of the limbs, the ribs, and the cranium, as well as in other symptoms of its confirmed existence.

The separation of these classes was necessarily a matter of some deliberation, and could only be done after careful examination of all the symptoms; but after a little time it was not difficult to say to which of the three degrees of severity each case should be relegated, although it might not quite accurately conform to the symptoms designated as above. It was a curious fact that the numbers in Classes I. and II. were identical, viz., sixty-eight in each, whilst the most severe cases amounted only to fourteen.

Perhaps the most important of all my tables was that which gave the age of weaning of the child, and this seems

to be a factor of no small importance in the etiology of this disease. Of the 150 patients, nineteen had been brought up entirely by hand. Including these, the average age of weaning in the whole number (excepting ten where the age of weaning was not known) was ten months and a half; while, excluding these nineteen, the average age was 12·2 months

These figures appear to be somewhat contradictory; and it may be argued that if early weaning were a cause of rickets, it would not also result from the prolonged nourishing from the breast. It must be remembered, however, that among the poor weaning is only a relative term, and that the mother in most cases only feeds the child from the breast occasionally, and that it is almost always given some artificial food in addition. Whilst, on the other hand, if food were supplied to a child for upwards of a twelvemonth, only from the breast of a poorly fed parent, that in itself might be held sufficient for the appearance of any dyscrasia in the child.

As regards the food which was given, I found that only ten of these children were supplied with milk alone, and that in seventy-six of the remainder the milk was mixed with some amount of starch food; whilst in fifty-nine some form of starch formed the staple on which the child was brought up. Five cases only were unaccounted for under this heading. Although I have not had in view the importance of starch feeding so prominently as Dr. Baxter, these figures are curiously in harmony with those which he has deduced.

One point struck me in this analysis as of some import. Among the patients brought to Great Ormond-street Hospital for Sick Children are no inconsiderable proportion of the children of foreign parents. Out of the 150 cases here tabulated, only one was of foreign parentage; and if I am correct in my belief that foreigners are more careful and more judicious in the way that their young are fed, this fact would go some way to support Dr. Baxter's views. Struma in all its forms is common enough among these foreign children; and I saw lately the child of a French father and an English mother which presented the most aggravated symptoms of rickets that I have ever witnessed at the age of eleven months.

An element of some importance with regard to the feeding of London children is the habitual carelessness of the parents as to the state of the child's bowels. Almost invariably, on inquiring into the condition of the motions, one is told that they are quite right; but on asking further, one learns that they are constantly green in colour, offensive in smell, and otherwise far from what they should be. I would lay more stress on this neglect of the condition of the digestive organs than on the quality or nature of the food; and, although I believe that starch foods are more pernicious

than others, one sees many cases of rickets which cannot be ascribed to the effect of such a diet. For instance, I have lately had under my care a male child, aged two years, who was one of twin boys, equally healthy at birth. One child was nursed by the mother entirely till nine months old, and he is perfectly healthy and strong; the other was brought to me on account of very pronounced rickets. This child had been brought up entirely by hand, and had been fed for the first year entirely on cow's milk.

The only other subject into which I made inquiry was as to the extent and character of the deformity of the various bones which were affected. Enlargement of the epiphyses of the ribs was found to be almost constant, while those of the radii and tibiæ were affected with about equal frequency. Curvature of the tibiæ was most frequently outwards; anterior and antero-external curvature were met with in about an equal proportion of cases.

Some deformities were curious and unusual, but the fact was established that in all cases they were symmetrical. This fact seems to point to the idea that all these deformities are due to a vitiated growth at the epiphysial line; and the theory that the weight of the body acting on the softened bones causes them to bend does not commend itself to argument. If that were the case, since a child always begins by crawling, the femora would invariably be curved, whereas they are found to be so in a very small proportion of cases; and since a child uses one leg for propulsion and the other for support, they could not be symmetrically deformed.

This subject has been so recently before your readers that I forbear commenting at greater length on the results above given; but the views of Dr. Baxter have been so generally approved, that I am anxious to add, in the briefest possible way, the results of my own investigations, which so curiously coincide with his in their results.