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Whole Article

NUTRITION OF EXPECTANT AND NURSING MOTHERS

INTERIM REPORT OF THE PEOPLE'S LEAGUE OF HEALTH

THE People's League of Health appointed a special committee * in July, 1935, to consider the effect of the nutrition of expectant and nursing mothers on maternal and infant mortality and morbidity. The committee has now completed a survey which involved the study of the records of 5022 women and which the committee believes to be more comprehensive than any similar investigation previously carried out. The league had the coöperation of 10 London hospitals: East End Maternity Hospital; Hammersmith Hospital (LCC); Mother's Hospital (Salvation Army); Queen Charlotte's Hospital; Queen Mary's Maternity Home; Royal Free Hospital; St. Mary Abbot's Hospital (LCC); St. Thomas's Hospital; Thorpe Coombe Maternity Hospital; and University College Hospital. Three commercial firms—Messrs. Vitamins Ltd., Crookes Laboratories and Roche Products Ltd.—supplied the vitamin and mineral elements required, free of charge.

The main investigation, which was carried out from March, 1938, to the end of 1939, was planned to show whether additions of vitamins and minerals to the food would benefit the course of pregnancy and labour and the newborn child. In order to obtain some information concerning the type of diet consumed by the group of women to be studied, an inquiry was made among expectant mothers attending four of the hospitals which collaborated in the test; these patients included some of the women enrolled in the investigation. It was not possible to make a detailed dietary survey, but nearly 1000 women filled in questionnaires recording the food they had eaten during a week. This was at best a rough and ready method of assessing food consumption, but there were good reasons for believing that it would give some evidence of the nutritional level of the women during the experimental period. A scoring system was adopted by which arbitrary values were given to express the daily consumption of the more important foodstuffs, such as milk, butter, wholemeal bread, fresh vegetables, fatty fish, fruit, eggs, &c. By making a sum of the weekly score for appropriate foods, approximate estimates could be made of the intakes of first-class protein, vitamins, minerals, &c., while from a general summation a picture of the diet as a whole was obtained. This procedure was

sufficient to reveal any well-marked deficiencies in the diet. A somewhat similar scoring system has recently been found of great practical utility in nutritional investigations in Toronto.

Analysis of the records showed that, in general, there was no well-marked deficiency of first-class protein among any of the women answering the questionnaires. As regards minerals, a shortage of calcium was noted in about 70% of the women, most of whom were consuming insufficient milk and cheese. Iron deficiency was even more serious, only 2% of the women having a satisfactory intake. As regards vitamins, the deficiency of A was the most common, this being anticipated from comparison with other pre war data. Rather more than half of the women were taking less vitamin A than they required. Generally speaking the diets were not badly defective in vitamin B₁, but nearly half the women were not obtaining as high an intake as was really desirable. Vitamin-C shortage also affected about half the women, but once again the deficiency was not nearly so great as had been expected. The general impression was that the women were on the average better nourished than had been expected from previous surveys of comparable groups

* The executive committee included nine fellows of the Royal College of Obstetricians and Gynaecologists: Prof. JAMES YOUNG (British Postgraduate Medical School), chairman, Miss MARGARET BASDEN (Mothers' Hospital, Salvation Army), Prof. F. J. BROWNE (University College Hospital), Prof. AMY FLEMING (Royal Free Hospital), Dame LOUISE MCILROY (Thorpe Coombe Maternity Hospital), W. C. W. NIXON (St. Mary Abbots, Hospital, LCC), medical secretary, W. H. F. OXLEY (East End Maternity Hospital), L. CARNAC RIVETT (Queen Charlotte's Hospital) and JAMES WYATT (St. Thomas's Hospital); and the following: H. DAVIS, PHD, PHC (pharmacist UCH), Prof. J. C. DRUMMOND (professor of biochemistry, University College, London), Miss LETITIA FAIRFIELD, MD, (senior medical officer, LCC), W. T. RUSSELL, FSS (statistician, London School of Hygiene), Miss JEAN WISHART, SRN, (Queen Mary's Maternity Home) and Miss OLGA NETHERSOLE (founder and honorary organiser, People's League of Health).

of the ordinary population. Many of the women were clearly following advice given at the antenatal centres, and fresh fruit and eggs frequently entered into their daily diet. The same was true of milk. The women said they were taking these foods especially because they had been advised that the health of their babies would thereby be improved. There were, however, instances in which the dietaries were grossly defective.

The committee next decided on the amounts of vitamins and minerals required to make up the deficiencies noted. The daily supplements used for the experiment were:

Saccharated iron carbonate, gr. 18 (1.2 g.), equivalent to 0.26 g. ferrous iron.

Calcium lactate, gr. 30 (2 g.) equivalent to 0.26 g. calcium.

Minute quantities of iodine, manganese and copper.

Adsorbate of vitamin B₁ containing all factors of the B complex (B₁ content standardised at 200 I.U. per g.) gr. 15 (1 g.).

Vitamin C (ascorbic acid), 100 mg.

Halibut liver oil (vitamin A, 52,000 I.U. per g. and vitamin D 2500 I.U. per g.), min. 6 (0.36 g.).

In each hospital the women enrolled at the antenatal clinic were divided into two main groups by placing them alternately on separate lists. The women in one group received the supplements, while those in the other were kept as controls. Within each of these groups the women were further classified into primigravidae and multiparae.

These two groups were again subdivided into women under 25, between 25 and 30, and over 30 years. All women who were not in good health or whose delivery was expected in less than 16 weeks were excluded from the experiment.

The groups of important records thus obtained have been analysed by Mr. W. T. Russell, the statistical member of the committee, and his assistants, but the extent of the material collected and the exigencies of the war have made it impossible to prepare a full report at present. In view, however, of the importance of certain facts which have emerged it has been decided to issue this preliminary report.

TOXÆMIA OF PREGNANCY

At the beginning of the research it was decided to regard as toxæmic (*a*) women who exhibited hypertension (a systolic blood-pressure of or above 140 mm. Hg or a diastolic pressure of or above 90 mm. Hg) with or without albuminuria, œdema, &c., and (*b*) women who had no hypertension but in whom the diagnosis was based on albuminuria. In the 1530 primigravidæ who received the supplementary diet the toxæmia-rate on this standard was 27.1%, while in 1512 primigravidæ who did not receive the supplementary diet the rate was 31.7%, the difference being $4.6 \pm 1.7\%$. This result was due to the dominating influence of the women aged 25-30, in whom the difference was $7.7 \pm 2.6\%$. At the younger and older ages the difference, although still favouring the treated groups, was statistically unimportant. In multiparæ there was no difference between the two groups, the incidence of toxæmia being 21.8% in both 980 treated and 999 controls.

Within recent years it has come to be recognised that a diagnosis of toxæmia cannot be based on hypertension by itself, for this often connotes not a true or specific pregnancy toxæmia but an essential hypertension. The exclusion from the above groups of women with hypertension as the sole clinical abnormality leaves those in whom the diagnosis of toxæmia is based on albuminuria, œdema, &c., with or without, but generally with, hypertension. This treatment of the figures may exclude some cases in which the hypertension is due to toxæmia but any such disadvantage is offset by the fact that, apart from any possible differential benefit derived from the supplementary diet in one group, each group is being similarly treated. It has the advantage of segregating for special study those cases in which the diagnosis of toxæmia rests on a reasonably secure foundation. On this basis the primigravidæ who received the additional dietary ingredients had an incidence of toxæmia of 5.4%, while in the primigravidæ who did not receive any additional diet the percentage was 7.4. The difference and its standard error was 2.0 ± 0.9 , which means that the odds are nearly 40 to 1 against such a result being obtained by mere chance. The figures were also favourable to the

parous women receiving the supplements but not to a significant degree, the percentages being 3.6 for treated and 5.2 for controls, and the difference 1.6 ± 0.9 (see table). The women receiving the special diet are therefore protected against the risk of toxæmia in a ratio which is almost 30%. When it is remembered that, next to puerperal sepsis, toxæmia constitutes the most important cause of the maternal death-rate (about a fifth of the total), in addition to being one of the most

	No of women	Hyper-tension only		Albuminuria with or without hypertension		Hypertension with albuminuria, &c. ("pre-eclampsia")	
		No. of cases	Percentage	No. of cases	Percentage	No. of cases	Percentage
<i>Primips—</i>							
Treated	1530	332	21.7	83	5.4	69	4.51
Controls	1512	368	24.3	112	7.4	97	6.42
Diff. (C-T), and SE	2.6 ± 1.5	..	2.0 ± 0.9	..	1.91 ± 0.82
<i>Multips—</i>							
Treated	980	179	18.3	35	3.6	31	3.16
Controls	999	166	16.6	52	5.2	46	4.60
Diff. (C-T), and SE	1.7 ± 1.7	..	1.6 ± 0.9	..	1.44 ± 0.87
Total ..	5021	1045	..	282	..	243	..

SE = standard error.

fertile sources of chronic ill health after childbirth, the findings become highly significant. This investigation has been carried out in the London area, in which the incidence of toxæmia is low, and a reduction of 1.8% has been obtained. If a similar reduction could be obtained for the whole country it is estimated, on the basis of the annual number of births (approximately 600,000 in the immediate prewar years in England and Wales), that there would be 10,000 fewer cases of toxæmia in the year.

In a further classification based on the criteria generally accepted for "pre-eclampsia"—namely, hypertension with albuminuria, œdema, &c.—the following toxæmia-rates were obtained: treated primigravidae 4.51%, untreated primigravidae 6.42%, difference 1.91 ± 0.82 ; treated multiparæ 3.16%, untreated multiparæ 4.60%, difference 1.44 ± 0.87 (see table).

THE INFANT

Prematurity.—The committee found evidence, which it regards as statistically significant, of benefit to the infant from the improved diet of the pregnant mother. The chances of a woman carrying her child to term are improved by the diet. Thus, out of 1529 primigravidae receiving additional diet, in 308 or $20.1 \pm 1.10\%$ the pregnancy ended prematurely (before the 40th week), while in 1512 primigravidae who did not receive any addition prematurity occurred in 361 or $23.9 \pm 1.10\%$. The figures for multiparæ were almost the same— $20.1 \pm 1.33\%$ for treated and $24.2 \pm 1.33\%$ for untreated. The differences in both instances are greater than mere chance fluctuations. The relatively greater proportion of deliveries at term among the treated women is of particular importance in view of the Registrar-General's finding that 50% of infantile deaths under one month are due to prematurity.

Birth-weight of baby.—For primigravidae of all ages the difference is slight— 7.18 ± 0.03 lb. for the treated as against 7.17 ± 0.03 lb. for the controls, but a similar comparison for age 30 and over reveals a wider range, the babies of treated mothers weighing 7.17 ± 0.7 lb. as compared with 6.99 ± 0.07 lb. in the controls. The difference here is 0.18 lb., which approaches significance. In the multiparæ of all ages the difference between the birth weight is 0.07 ± 0.05 lb., which is not significant, but the trend of the values favours the treated women, for in 3 out of the 4 age-groups their babies were slightly heavier. There is a considerable difference in the

average birth-weights in different hospitals. In hospital B the mean value was 6.98 lb. for babies of primigravidae, against 7.22 lb. and 7.42 lb. in hospitals G and J. The corresponding weights in the multiparæ class were 7.43 lb., 7.62 lb., and 7.89 lb. The differences between these mean weights are statistically significant and the deviations merit further investigation.

OTHER EFFECTS

The committee could not find any evidence that the vitamin and mineral additions to the dietary appreciably affected the risk of fever and sepsis after childbirth. Nor did they find any appreciable influence on the character and duration of labour.

An additional investigation under a special subcommittee with Sir Norman Bennett as chairman was arranged to study the effect of the special dietary on the teeth of the mothers. It was possible to carry out the investigation in only 314 cases, at the East End Maternity Hospital, Hammersmith Hospital, the Royal Free Hospital (Eastman Clinic), St. Thomas's Hospital and Queen Mary's Maternity Home. The results were inconclusive. One of the objects of the research was to see the effect on the teeth of the babies born of those mothers who had received the supplementary maternity diet, and it was planned to do this by means of a "follow-up" process of the children for five years, but owing to the war this was impossible.

COMMENT

The committee emphasise that the investigation could not be expected to discover the full extent of the benefits of a well-balanced diet in the antenatal period. They had to avoid the risk that vitamins and minerals intended for the mother would be merely added to the general family stock; the substances were therefore given in tablet or capsule form. Moreover, as was to be expected, some women defaulted. It may further be urged that the full value of such protective substances can be realised only when they are given in the form of natural foods. For these reasons the committee feel that the results of the investigation, valuable as they are, should be regarded as pointing to the minimal rather than the maximal advantages of a well-balanced maternal dietary. It should also be mentioned that the results obtained concerned women whose basic diet was probably somewhat better than that of similarly constituted groups of women at the present time.

This comprehensive and controlled investigation furnishes for the first time clear evidence on questions which have long been in dispute. The demonstration of the influence of a well-regulated diet on the health of mothers and on the development and well-being of their infants is of national importance. Further, the message is addressed to all sections of the community, for it is not solely among the poorer classes that defective nutrition is prevalent. At the same time, since poverty and malnutrition march hand in hand and since the poorer classes are relatively the most fertile, it follows that the ravages of faulty maternal nourishment fall with tragic emphasis on the mothers in poor homes and their children.

The committee are indebted to Miss Gladys Kitchener, secretary of the People's League of Health, and to the secretarial staff for their work in this research.

