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Whole Article

EFFECT OF CALCIUM AND VITAMINS A AND D ON INCIDENCE OF PREGNANCY TOXÆMIA

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THE following experiment, carried out at St. Mary Abbots Hospital,* London, during 1936, was devised to determine whether the mere addition of calcium and vitamins A and D to the dietaries of patients attending the antenatal clinic would have any effect on the incidence of toxæmic symptoms.

Apparently healthy women, not more than twenty-four weeks' pregnant, were divided by the sister into two groups when they first attended at the clinic, no attention being paid to their previous obstetric histories. They were divided at random in the following manner:—

An equal number of blue and white beads were placed in a box. Each woman accepted for the experiment was asked to draw a bead from the box. Those who drew blue beads were placed in Group A while those who drew white beads were placed in Group B. The beads drawn out were placed in a separate container.

The patients in Group A were requested to take daily, for the remainder of their pregnancies, calcium lactate 20 grains, vitamin A (11,000 international units) and naturally occurring vitamin D (450 units); while those in Group B served as controls. The oil containing the vitamins was supplied in capsules, of which four were to be taken every day, while the calcium lactate was distributed in the form of tablets. No advice concerning diet was given to either group

of patients.

Each group contained 50 women. In Group A 25, and in Group B 26, were primigravidæ. The symptoms were recorded by independent antenatal officers who had no knowledge as to which patients were receiving the additional substances. All patients developing albuminuria, showing hypertension, or suffering from excessive vomiting, or œdema were admitted into the antenatal ward. Those suffering from insomnia or severe headaches were also advised to go into hospital.

RESULTS

The results obtained are shown in Tables I and II. The symptoms of the patients admitted for albuminuria and hypertension are not included, so that the heading "symptoms" refers to patients

* This obstetric unit is affiliated to the British Postgraduate Medical School, Hammersmith, London.

not included in the above two categories. A systolic blood pressure of, or exceeding, 140 mm. Hg was considered evidence of hypertension. The numbers

TABLE I

Incidence of Toxic Symptoms in Treated (A) and Untreated (B) Women

—	GROUP A (50).		GROUP B (50).	
	Cases.	Primi-gravidæ.	Cases.	Primi-gravidæ.
Albuminuria and hypertension ..	2	1	3	2
Hypertension ..	3	1	8	4
Albuminuria ..	2	2	6	3
Other symptoms ..	6	2	11	4
Totals	13	6	28	13

TABLE II

Analysis of "Other Symptoms"

—	Group A.	Group B.
Hyperemesis	2	4
œdema	3	3
Headaches	2	5
Cramps	1	3
Insomnia	2	6

Totals	10	21
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suffering from "other symptoms" are shown in Table II, most patients complaining of more than one symptom.

COMMENT ON THE FINDINGS

Prof. E. S. Pearson, of the department of statistics at University College, London, has been kind enough to study these figures and has expressed the opinion that the difference in incidence of "complications" between the two groups is very unlikely to have arisen by chance. It is therefore desirable to consider factors, other than the diet, which may have contributed to this difference.

Of the 100 patients, 76 were between twenty and thirty years of age. Of the primigravidæ 4 (2 in each group) were under the age of twenty, each being nineteen years of age. The number of women over thirty was 20, including 2 primigravidæ in each group: 9 of these were in Group A and 11 in Group B. It is thus evident that the ages of the women in the two groups were strictly comparable.

It has already been stated that no regard was paid to the previous obstetric histories of the multigravidæ. There are arguments in favour of confining future experiments to primigravidæ, but it would have been impossible to take previous obstetric histories into consideration unless all the confinements had taken place in comparable institutions. One woman in Group A, admitted for albuminuria and hypertension, had been twice previously confined—on both occasions in St. Mary Abbots Hospital. In her first pregnancy she had suffered from eclampsia, and during her second pregnancy she was admitted for albuminuria and hypertension. As the result of treatment in the ward her urine became protein-free and her blood pressure returned to normal limits before she was delivered of her third child. The previous obstetric

histories of many of the patients were unobtainable, but it is significant that the same difference in incidence of "complications" between the two groups is observed among the primigravidæ as among the multigravidæ.

All the patients in the experiment were observed equally often over approximately the same period of time. No woman was included who was not in the position to take the "protective substances" for sixteen weeks before delivery, and no one took them for more than twenty weeks. The social status of all the patients was, so far as could be judged,

strictly similar. There was no room for variation in the "standards" adopted by the antenatal officers, for the criteria were well defined. If albumin was found in the urine a catheter specimen was subsequently obtained and tested. No patient was recorded as suffering from albuminuria unless albumin was detected in a catheter specimen. Similarly, no patient was admitted for hypertension unless, after rest, the systolic pressure equalled or exceeded 140 mm. Hg. A symptom, such as headache, was accepted only if it persisted and was severe. Moreover, I myself saw every patient who was admitted to the antenatal ward and confirmed the findings of the antenatal officers.

It therefore seems logical to assume that the difference in the incidence of "complications" between the two groups must, if not due to chance, be attributed to the substances given. This assumption is strengthened by the results of the dietetic treatment of these patients in the antenatal ward. The symptoms cleared up in every case. A slight degree of albuminuria, not exceeding 0.05 per cent., persisted in 3 of the 13 patients admitted for this condition, while the blood pressure returned to the normal in 13 of the 16 patients admitted for hypertension. These results strongly suggest that the other main factor in the prevention of the toxæmias of pregnancy is the vitamin-B complex.

It is somewhat disappointing that, after waiting so long for the opportunity of conducting this experiment, the number of women included should be so small. This is due to the fact that only a small proportion of the patients booked sufficiently early and attended the hospital antenatal clinic throughout their pregnancies. These results, however, point in the same direction as those obtained by Mendenhall and Drake,¹ and are published in the hope that further experiments on a larger scale will be conducted elsewhere. There is no proof that all the patients in Group A took their capsules and tablets regularly, and it might be expedient to incorporate a trace of methylene-blue in each tablet.

Experiments conducted on these lines would show to what degree, if any, the different protective substances are associated with toxæmic symptoms. It is my belief, for instance, that vitamin A is of more importance in preventing senile changes in the placenta, and consequent death of the fœtus, than in preventing toxæmic symptoms. Then, too, experiments conducted in different parts of the country might show that the degree of deficiency of any given protective substance varied from area to area. On the other hand, all the protective substances could

be incorporated in a pill and a capsule and be distributed at a cost not greatly exceeding that of a daily pint of milk.

There is one further and still more important reason why such investigations should be under-

¹ Mendenhall, A. M., and Drake, J. C. (1934) *Amer. J. Obstet. Gynec.* 27, 800.

taken. Some authorities maintain that the great majority of the adult population suffers from some degree of malnutrition, while others deny that there is any evidence, other than an incidence of secondary anæmia, in favour of such a conclusion. Dietetic surveys indicate that the average intake of the protective substances is inadequate, when calculated on a rat basis, but the transference of results from the rat to man is not justified, and it must be admitted that the optimum and minimum human requirements of these substances are not known. It is, however, universally accepted that pregnancy makes an increased demand on the maternal stores of the vitamins and minerals, and this is true of every experimental animal. If, therefore, neither the toxæmias of pregnancy nor intra-uterine death of the foetus are to be attributed to dietetic deficiencies, then it may be asserted that there is no evidence whatsoever that any significant section of the adult population suffers from malnutrition. Conversely,

if the toxæmias of pregnancy are due to this cause then there is every justification for the assumption that similar symptoms and "diseases," such as insomnia, headaches, cramps, pyelitis, albuminuria, hypertension, skin rashes, and jaundice, occurring in the non-pregnant state, may likewise be due to dietetic deficiencies. It may, with reason, be concluded that the proof, or disproof, of the dietetic deficiency hypothesis of the toxæmias of pregnancy affords the only available experimental means of determining whether malnutrition, other than iron deficiency, is a significant cause of ill health and diminished vitality in the adult population of this country.

I have pleasure in thanking Sir Frederick Menzies, medical officer of the County of London, for permission to carry out this experiment, and to publish the results. I should also like to take this opportunity of thanking Miss F. R. Sindon, the maternity sister, for so willingly undertaking the extra work necessitated by this investigation.

