

## EFFECT OF NUTRIENT SUPPLEMENT ON THE INCIDENCE OF TOXAEMIA OF PREGNANCY

by

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The twentieth century will be remembered among other things for its tremendous progress in medical sciences — not the least of which has been in the field of obstetrics and gynaecology. As a result, maternal mortality has been greatly reduced by controlling infection and haemorrhage, but unfortunately not much progress has been made in the field of toxæmia. The obstetricians are still in the dark regarding the aetiology and prevention of toxæmia, and the treatment of this disease even today is entirely empirical.

World opinions regarding the role of nutrition in the aetiology of toxæmia are still not crystallised, and as late as in 1966, Professor Jeffcoate, in his presidential address to the Royal Society of Medicine, London, said, "The influence of the nutritional status of a woman to her proneness to develop pre-eclampsia and eclampsia, therefore, remains ill-defined."

By carrying out nutritional assessment (Chaudhuri, 1968 a) and diet survey (Chaudhuri, 1968 b) on a group of patients, the author noted a definite association between nutri-

tional deficiency and toxæmia of pregnancy. It was further observed by him (Chaudhuri, 1968 c) that the incidence of toxæmia was statistically higher in the lower socio-economic class than that in the higher socio-economic class. The same observation was made by earlier investigators working in different parts of the world, such as Theobald (1930) in the eastern countries, DeSnoo (1938) in America, Baird (1945) in Aberdeen and Mahfouz Pasha (1946) in Egypt. Nutritional deficiency was also found to be of more statistical significance in the former class of patients. The same class of patients had less antenatal care than the other economic classes, which also has some bearing on the development of toxæmia.

From the above observations, though a definite association is found between nutritional deficiency and toxæmia, the role of nutrition in the aetiology of toxæmia can be proved conclusively if the incidence of toxæmia can be reduced by improving the nutritional status of a group of people. It was with this object in mind that the present study was conducted. Only cases of pre-eclampsia were taken into account in this experiment. Cases were diagnosed as pre-eclampsia only when they

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manifested hypertension for the first time after 24 weeks of pregnancy, together with any or both of the other two signs, namely oedema and albuminuria. Hypertension was recorded only when the systolic blood pressure was above 140 mm. Hg. and/or diastolic pressure above 90 mm. Hg. on two consecutive visits or after 24 hours' rest in bed. Cases with only oedema or albuminuria or both, however severe, were not diagnosed as toxæmia. Similarly, cases with only hypertension or with hypertension developing before the 24th week or with a history of previous hypertension were excluded from the present study.

#### *Selection of Cases*

Group A—Five hundred cases below 24 weeks of pregnancy were selected at random from the antenatal clinic. They were divided into two groups by selecting alternate cases after eliminating some as detailed below.

Group B—Two hundred cases from the antenatal clinic were observed. Only cases who first attended the clinic after 36 weeks or those who came with features of toxæmia without any previous antenatal care were taken in this group. These cases were observed only to see the incidence of toxæmia and the parity distribution in them, which figures were used for comparison with the results of the experimental study.

#### *Methods*

All the patients in Group A were examined clinically. Haemoglobin estimation and urine examination

were done routinely. All cases of anaemia and those suffering from intestinal troubles, particularly diarrhoea, had stool examinations. They were treated for their ailments, such as amoebiasis, parasitic infestations etc., and other antenatal care was taken, but no special treatment was given for minor nutritional deficiencies. The cases with gross anaemia or other nutritional disorders which needed immediate care were eliminated. The selected cases were divided into two groups. One group was given all the antenatal care as stated above but no vitamin-mineral supplements for the sake of the experiment. The other group was treated with tablets of vitamin-mineral containing daily ingredients as follows:— vitamin A—5000 I.U., vitamin D—1000 I.U., thiamine—3 mg., riboflavine—2 mg., nicotinamide—20 mg., vitamin C—30 mg., copper sulphate—5 mg., manganese sulphate—5 mg., exsiccated ferrous sulphate—290 mg., calcium phosphate—0.25 gm., and calcium gluconate—3 gm. Those who could afford to buy them were advised to buy the pills from the market and take one tablet of Becadex (Glaxo), two tablets of Fersolate (Glaxo) and two tablets of Calcium (Sandoz) daily. Those who were not in a position to buy them were supplied the medicines free of cost. All patients were advised to take one pint of milk, one egg and more of leafy vegetables over and above their usual diet if they could afford them. Each patient was examined every week or fortnight and each time they were asked if they were taking the pills regularly.

Non-cooperative or irregular patients and those who developed serious manifestations of nutritional deficiency needing immediate care were dropped from the study. The patients who did not attend the hospital up to the time of delivery were also eliminated.

### Results

In the final stage of the study, out of 250 cases in the first group, who had antenatal care without vitamin-mineral supplement, there were 178 cases, of which 53 were primiparae and 125 were multiparae. In the second group, who had both antenatal care and the nutrient supplement, out of 250 cases 164 cases were avail-

able, amongst whom were 51 primiparae and 113 multiparae. Whereas in the control group, out of 200 cases there were 59 primiparae and 141 multiparae. Therefore, the parity was more or less the same in the three groups. The results of the study are shown in Tables 1 and 2.

The results of this experiment show that antenatal care even without nutrient supplement has reduced significantly the incidence of severe toxæmia from 12 per cent to 5.6 per cent, and of total number of toxæmia from 23 per cent to 14.6 per cent, but it has not reduced significantly the incidence of moderate toxæmia. But vitamin-mineral supplement has reduced significantly the incidence of

TABLE I

*Effect of Antenatal care and nutrient supplement on toxæmia of pregnancy*

Subjects	No. of cases	Incidence of toxæmia					
		Moderate toxæmia		Severe toxæmia		Total No. of toxæmia	
		No. of cases	Per-cent	No. of cases	Per-cent	No. of cases	Per-cent
With no antenatal care	200	22	11%	24	12%	46	23%
With antenatal care but no nutrient supplement.	178	16	9%	10	5.6%	26	14.6%
With antenatal care and nutrient supplement.	164	6	3.6%	2	1.2%	8	4.8%

TABLE II

*Statistical significance of differences in the incidence of toxæmia of the three groups of cases of table 1*

Subjects	t values		
	Moderate toxæmia	Severe toxæmia	Total No. of toxæmia
No A.N. care Versus A.N. care-supplement	0.67	2.16	2.07
A.N. care-supplement Versus A.N. care + supplement	2.00	2.21	3.00
No A.N. care Versus A.N. care + supplement	2.61	3.97	4.83

Figures in bold type are significant.



toxaemia, not only of the severe type from 12 per cent to 1.2 per cent but also of the moderate type from 11 per cent to 3.6 per cent.

In cases where antenatal care is the same, nutrient supplement has reduced significantly the incidences of both moderate toxaemia from 9 per cent to 3.6 per cent and of severe toxaemia from 5.6 per cent to 1.2 per cent, and naturally of total number of toxaemia from 14.6 per cent to 4.8 per cent.

Fig. 1 shows the effects of antenatal care and nutrient supplement on the incidence of toxamia of pregnancy.

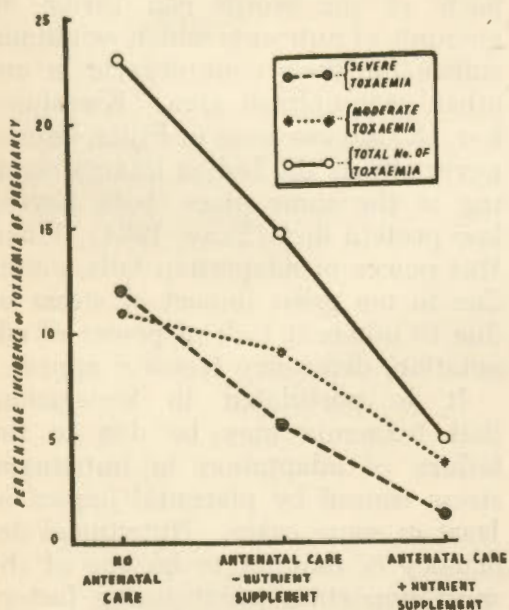


Fig. 1

Effect of nutrient supplement and antenatal care on the incidence of toxaemia of pregnancy.

### Discussion and Conclusion

The present study has convincingly proved that by giving nutrient

supplement to all pregnant women from early weeks of pregnancy, the incidence of toxaemia, both of moderate and severe degree, can be significantly lowered to a very low level, over and above that which can be achieved by only antenatal care without the supplement. Of the nutrients, vitamins and minerals seem to be the most important factors in the prevention of toxaemia.

In this study all the important vitamins and minerals were supplied instead of specific isolated ones, because it is becoming more and more recognised that multiple partial deficiencies are usually present even when a specific deficiency features most. It is well known that though human beriberi is specifically due to deficiency of vitamin B<sub>1</sub>, it can not be produced in its typical form unless there are other deficiencies. Though xerophthalmia and pellagra are due to specific deficiencies of vitamin A and B<sub>6</sub> respectively, they respond much better when protein is also added to the diet together with the specific vitamins.

Though the present findings do not tally with those of Ross *et al* (1938) and of the Toronto experiment (Ebbs *et al*, 1941), they agree with those of the People's League of Health experiment (1942) which is by far the most elaborate, methodical, biggest and best field trial ever conducted in this field of study. However, the former two trials are subject to certain criticisms. Ross *et al* conducted their trials on a very small number of cases, only 27 cases in the supplemented group, for any statistical evaluation to be made.

The Toronto Experiment was con-



ducted by Ebbs *et al* in the Toronto General Hospital on 380 cases who were divided into 3 groups—one group of which with poor diet was supplemented with extra amount of food containing not only vitamins and minerals, but also extra amount of protein, fat, carbohydrates and calories. No difference in the incidence of pre-eclampsia was found in the three groups having poor diet, poor but supplemented diet and good diet, though a reduction in the incidence of 'toxaemia' in the supplemented group was found. However, indications have not been given as to what the term 'toxaemia' includes, and how it differs from 'pre-eclampsia'. Moreover, it is found from the analysis of their table, which shows the past obstetric histories of the three groups, that the incidence of abortions in the poor group is thrice that in the supplemented group, though both were receiving the same unsupplemented poor diet. The same criticism applies to the incidence of prematurity and still-births in the same table. These differences can only be due to a chance factor, yet they are as striking as the differences in the incidence of 'toxaemia' in the poor and 'supplemented' group (Browne, 1944). People's League of Health Experiment was carried out in 10 hospitals in London during 1938-39, on 5021 patients. Half of these cases were supplemented with vitamins and minerals. In the supplemented group there was a significantly lower incidence of toxaemia in primiparae. However, no such difference was found in the multiparae.

Human subjects have great powers of adaptation to nutritional stress

(Swanson, 1951; Duel, 1948; Darby, 1963). In the presence of an inadequate supply of any particular nutrient the body can adjust itself to the situation, either by a more economical use of what is available or by a lowering of its own requirements, so that eventually it comes into equilibrium with the limited food supply (Steggerda and Mitchell, 1941). But this remarkable power of adjustment of the body varies from one person to another and as such nutritional deficiency produces clinical features which vary in different subjects. Familial and racial factors also play their roles in this connection. As such, it is found that children in some parts of the world can thrive on amounts of nutrients which would not suffice for their counterparts in another geographical area. Kwashiorkar, though common in Fijian babies, never affects the Indian infants residing in the same place, both having low protein diet (Bray, 1934). When this power of adaptation fails, either due to too great impact of stress or due to inherent lack of power of adaptation, deficiency features appear.

It is postulated in conclusion, that toxaemia may be due to the failure of adaptation to nutritional stress caused by placental impact at least in some cases. Nutritional deficiency is thought to be one of the most important predisposing factors in the aetiology of toxaemia of pregnancy.

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