EFFECTS OF FOLIC ACID SUPPLEMENTATION ON BIRTH WEIGHT OF INFANTS

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After the second world war, more so after a developing country like India attained independence, the question of marasmic infants and children has exercised the minds of those who are committed to look after the national health. What is true of infants and children is equally true of women who give birth to such children. Perhaps a basic question has eluded the notice of experts. Is a child made marasmic or born marasmic? General opinion is that they are made marasmic. But the fact is that they are born marasmic. A woman suffering from the pangs of hunger and want cannot boast of a healthy foetus and an unhealthy or undeveloped foetus cannot advance to a healthy and developed infant.

In an overpopulated country like India, it is a strange phenomenon that more women belonging to low-income group and less higher income group usually deliver more than half a dozen children. Majority of these women are anaemic having deficiency of iron, folic acid, calcium, vitamins A, D and last but not the least B_{12} which are most essential for pregnant women.

Pregnancy is a period of great physiological stress and strain. The requirement of most of the nutrients increases during pregnancy. Various studies by Iyengar (1967, 1969 and 1974), Venkatachalam (1962) and Niyogi and Yajwani (1963) show that maternal nutritional status directly affects the birth weight of the baby. During pregnancy, the total caloric requirement increases. On an average, 300 cal/day more have to be supplemented during the last trimester. The extra calories should be supplemented by adequate quantity of protein, approx. 10 gm/day. Diet apart, other nutritional factors affecting the birth weight of the infants are iron, folic acid and B_{12}.

During pregnancy, however, the requirement of metabolically active forms of folic acid is considerably increased (Herbert, 1962). Pritchard (1962) states that the foetus and placenta extract folic acid from maternal circulation. Faulty folate metabolism is an important cause of placental abruption, abortion and foetal malformation (Hibbard, 1964). It has been concluded that danger of folic acid deficiency is so grave that early prophylaxis even before conception is advis-

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able. The present study was made to determine the effect of folic acid supplementation during third trimester of pregnancy on the birth weight of the babies.

Material and Method

Two hundred and eighty-five pregnant women were selected for the study from the Antenatal Clinic of Lok Nayak Jayaprakash Hospital attached to Maulana Azad Medical College, New Delhi. The period of pregnancy ranged from 24 to 28 weeks so that folic acid supplementation could be given for a period of atleast 12 weeks before delivery. In none of these cases there was any past or present medical or surgical problem. The cases with bad obstetric history were also not included in the study.

The objective of the study was explained to the patients. Socio-economic background of each case was determined after close examination. The findings were noted in a proforma. Detailed past obstetric history and course of present pregnancy were recorded. Menstrual history was also recorded in detail including the last menstrual period, so that expected date of delivery could be calculated. Further examination was conducted on weight, height, general condition, blood pressure, heart, lungs, fundal height, foetal presentation and foetal heart. Routine investigations were made on urine, haemoglobin, blood group and Rh factor. Cases selected for the study had their haemoglobin level above 9 gm%. The follow up was done every fortnight upto 36 weeks and every week after that.

The selected subjects were put into 2 random groups. In the first group of 184 women, 120 mgms of iron and 5 mgms of folic acid daily were supplied. In the second group of 101 women, only 120 mgms. of iron was supplied daily. The drugs were given throughout the third trimester of pregnancy and continued even after delivery. Group one was called experimental group while the other served as a control. The amount of iron supplementation was same in both the groups. The control group got folic acid from the diet alone. The cases were followed till delivery. The nature of delivery, birth weight, sex and presence of gross congenital anomalies of the new born, if any were noted.

Results

There are various factors which can influence the birth weight of the newborn. The well known factors are maternal age, parity, height, weight and socio-economic status, (Shrivastava *et al.*, 1971; Pachauri 1970; and Datta 1969). Keeping these factors in view, cases were grouped with special reference to the factors common to both so that any effect of these factors except folic acid, be equally distributed to both the groups. The mean birth weight of infants, born to folic acid supplemented mothers, was 2.916 $\pm$ 0.05 Kg., while the mean birth weight of infants, born in control group, was 2.540 $\pm$ 0.06 Kg. The difference between the 2 groups was about 350 gms which was found to be statististically significant ($t = 4.601$). Results of the present study are shown in Table I.

Infants born to primiparas in folic acid supplemented group were considerably heavier and the mean birth weight was 2.902 $\pm$ 0.07 Kg., while in those of control group, the mean birth weight was 2.514 $\pm$ 0.08 Kg. This difference was also statistically significant. Similar results were seen in the infants born to multipara. In folic acid supplemented

TABLE I
Birth Weight of Babies in Folic Acid Supplemented Group and Control Group

Parity	Iron and folic acid supplemented group		Iron supplemented group	
	Mean birth weight in Kgs.	Total No. of cases	Mean Birth Weight in Kgs.	Total No. of cases
Primipara	2.902 ± 0.07	69	2.514 ± 0.08	53
Multipara	2.923 ± 0.08	115	2.571 ± 0.09	48
Average	2.916 ± 0.05*	184	2.540 ± 0.06	101

* Significance at 1% level
** Significance at 5% level

group, the mean birth weight was 2.923 ± 0.08 Kg., as compared to control group where mean birth weight was 2.517 ± 0.09 Kg. Male babies were found to be heavier than females but the difference was not statistically significant.

Correlation test was done between birth weight of the infants and corresponding folic acid intake of the mothers and was found to be 0.4172, which is statistically significant at 1% level and also significant at 5% level.

Discussion

The findings of the study clearly indicate that folic acid supplementation during third trimester of pregnancy is associated with increase in birth weight of new borns. Similar findings were observed in another recent study (Iyengar, 1974). It is during the third trimester that the maximum growth of the foetus takes place and for optimum growth of the foetus, increased amount of DNA and various enzymes are needed (Whiteside, 1968; Hibbard, 1964; Willoughby and Gewell 1968). Folic acid plays a major role in the synthesis of DNA and several enzymes. During pregnancy, however, the requirement of metabolically active forms of folic acid is considerably increased (Herbert, 1962). The chain of events which follow ingestion of folic acid is not very well understood. Some may be reduced and methylated through the intestinal walls; some may be absorbed unchanged and then taken up by the liver, thereby displacing 5-methyl tetrahydrofolate into the general circulation; and some may be removed to meet the requirement of tissue metabolism. Thus the circulating plasma folate activity will depend upon the amount absorbed, the amount metabolised by peripheral tissue, the amount excreted and the volume of extracellular fluid in which folate is distributed. All these are likely to change substantially during pregnancy (Edelstein, 1968; Pritchard, 1962, 1970). It is suggested that intestinal pH is an important factor in absorption of folic acid, absorption being slower at higher pH. Absorption of folic acid increases during pregnancy (Hansen and Rybo 1967 and Willoughby, 1968).

The main sources of folic acid are green leafy vegetables, dried beans, almonds, peanuts, oats, fish, liver fungi, etc. The green leafy vegetables and peanuts are the principal sources of folic acid for women in low socio-economic group. In both groups of patients of this series, these common sources of folic acid were available. Obviously from the study, as results show, the folic acid present in the

diet of the women of control group was not sufficient. That is why in the control group babies were lighter in weight. The folate in the food can be classified into 2 main groups. The ratio of the 2 in various food stuffs in different. The free folate makes up approximately 25% of the dietary folate (WHO, 1970).

Herbert (1962) estimates that in normal non-pregnant woman, daily requirement of folic acid is in the range of 50 to 100 mcg.

During pregnancy, the requirement of folic acid is more, but how much folic acid is needed in normal pregnant women is still to be decided. It is known that 400 mcg/day of folic acid orally sometimes produces a haematological remission in severely anaemic women who are consuming diet poor in folic acid and 1000 mcg/day of folic acid daily is quite sufficient after which megaloblastic anaemia is a rarity.

From the results arrived at by these studies, it is suggested that routine administration of folic acid should be supplemented with other prenatal essential vitamins to all pregnant mothers/women.

Summary and Conclusion

The present study was conducted to find out the effect of folic acid supplementation, during the third trimester of pregnancy, on birth weight of infants. Two hundred and eighty-five pregnant women were taken up for this study. The selected cases were divided into 2 groups at random. The first group of 184 women were administered 120 mg of iron and 5 mg of folic acid daily and the second group of 101 patients were given 120 mg of iron daily throughout the third trimester of pregnancy. The weight and sex of infants at the time of birth were duly recorded. A salient feature noticed was that the infants born in the first group (folic acid supplement) were heavier (their mean birth weight being 2.916 ± 0.05 Kg) as compared to the second group in which only iron was supplemented (mean birth weight being 2.54 ± 0.06 Kg). This difference was stastiscally significant and was not affected by the parity of the mother or the sex of the infant.

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