Role of Folic Acid in Avoiding Congenital Abnormality in Pregnancy

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Folic acid, a water soluble single vitamin, can prevent many congenital abnormalities of upcoming babies, mainly neural tube defects and some other aliments like anaemia, abortions, pre-term labour if taken by the mother in pregnancy period. However, for getting better result, folic acid should be supplemented 2-3 months before actual conception occurs; here is the role of building up public awareness regarding importance of folic acid intake by women.

INTRODUCTION

In 1930s, the English physician Dr. Lucy Wills, while working in the slum in Bombay, made a clinical observations i.e. deficiency of a hitherto unknown vitamin (later named as Folic acid/Folate) causes anaemia in young pregnant mill workers.

Later in 1964, another obstetrician Bryan Hibbard felt that folate had a role in early embryonic development.

In 1980, Richard Smith ells was first to show a role for this vitamin in the prevention of Neural Tube Defects (NTDs)/

Folic acid is a synthetic form of water soluble vitamin. The natural reduced form is food folate found in meat, legumes, but is very susceptible to oxidative destruction during the harvesting, storage and cooking of food. Bio-availability of the synthetic form is significantly more than food folate.

Folic acid is now considered as an important factor in reducing chances of NTDs, Megaloblastic anaemia of pregnancy and some other complications like spontaneous abortion, Intra Uterine Growth Retardation (IUGR) of baby, if supplemented mainly in periconceptional (2-3 months prep regnant up to first 12 weeks of pregnancy) period.

FUNCTIONS OF FOLIC ACID / FOLATE.

Folic acid is essential for the production of Methionine, which is a co-factor in RNA and DNA synthesis and is required for methylation of proteins, lipids and myelin. Folic acid is essential for growth, differentiation and repair; hence it is essential for featal development during pregnancy.

Folate deficiency or impairment in genetic folate metabolism is proposed mechanism that causes congenital birth defects like NTDs, cleft lip, cleft palate, cardiac defects.

Effects of folate deficiency in pregnancy also results in anaemia, spontaneous abortion, IUGR, preterm labour.

NEUTRAL TUBE DEFECTS (NTDS)

The neural plate folds in the brain and spinal cord region fuse in the midline by days 26 to 28 of embryonic life. Neural tube defects likely result from failure of closure in one or more sites. NTDs are second most common congenital birth defect.

World wide incidence of NTDs 1.4 to 2 per 1000 live births, Recurrency risk after one affected child is 30-40 per 1000 live births and after two affected child is 100 per thousand live births.

NTDs are classical example of multifactorial inheritance-a genetic factor, folate deficiency, teratogen exposure.

TYPES OF NTDs

(a) **Anencephaly** – is the most severe defect in which the forebrain meanings, vault of skull and scalp fail to form. It is lethal, resulting in stillbirth of early neonatal demise\

(b) **Encephalocele** – a protrusion of brain tissue, cerebrospinal fluid (CSF) and meanings through a defect in skull.

(c) **Meningomyelocele** – here spinal cord, nerve roots, meanings, CSF herniates through gap in vertebral body.

(d) **Meningocele** – here only meanings with CSF protrude through gap in vertebral body.

All types of NTDs create long term problem in the children that require management by a multidisciplinary team and is a huge economic burden to the parent and society.

Diagnosis – of NTDs can be done by prenatal screening using maternal serum AFP estimation and USG, if performed between 15-20 weeks of gestation with 95% accuracy.

No in-utero treatment is available for NTDs and option of termination of pregnancy is unacceptable for some parents.

FOLIC ACID SUPPLEMENTATION

Folic acid supplementation in the periconceptional period i.e., 2 to 3 month's periconception to first 12 weeks of pregnancy, is effective in primary prevention of NTDs.

The UK Medical Research Council (1991) set up a multicentric trial of folic acid in preventing the occurrence and recurrence of NTDs with an outstanding success and they conclude that folic acid taken periconceptionally could prevent majority of NTDs.

In 2004, Wald estimated that Folic acid supplementation (5 mg/day) preconception and continuing till 12 weeks after getting pregnancy reduce risk of NTDs by 85%. In the women with previous baby affected by NTDs periconceptional use of folic acid decreases the recurrence by 70%. However, the bigger problem to prevent occurrence of NTDs is that about 50% of all pregnancies are unplanned even in developed countries.

These findings led the Centres for Disease Control (1992) and the American College of Obstetricians and Gynaecologists (1996) to recommend that women of all child bearing age (15-45 years) consume at least 0.4 mg of folic acid daily and who had previously affected baby of NTD should consume 4 mg/day of folic acid periconceptionally. Perhaps most disappointing is that even amongst women who knows that periconceptional folic acid can prevent majority of NTDs, compliance is poor since the concept of taking a tablet daily is not accepted when they are feeling completely healthy.

FOLIC ACID FORTIFICATION

Fortification should aim to produce a daily dietary folic acid intake between 0.5 and 1mg based on the usual dietary folic acid intake between 0.5 and 1 mg based on the usual dietary practice of women of childbearing age. In Canada, folic acid id fortified with flour and in UK bread is used to fortify folic acid. Fortification of Food with Folic acid is safe even when taken chronically to a dose as high as 10mg/day.

PREVENTION OF MEGALOBLASTIC ANAEMIA

Before prophylaxis with folic acid was introduced on a widespread basis in pregnancy, overt anaemia was 1 in every 200 pregnancies in UK and could be as high as 25% of all pregnancies in developing countries. A deficient folate supply may result in impaired red cell formation causing megaloblastic anaemia. Folic acid requirement is increased during pregnancy for red cell growth and division. Prophylactic therapy is given to prevent megaloblastic anaemia in a dose of 400-500 µg/day (0.4-0.5mg) and should be continued specially in 2^{nd} and 3^{rd} trimesters of pregnancy.

PREVENTABLE AREAS IN PREGNANCY

To reduce the occurrence of other birth defects like cleft lip, cleft palate and congenital heart, folic acid supplementation is advised 400-500 ug/day periconceptionally. For probable prevention of spontaneous abortion dose is same. To prevent IUGR and pre-term labour, folic acid supplementation is advised to take a dose of 400-500 µg/day in 2nd and 3rd trimester of pregnancy.

ADDITIONAL RECOMMENDATION

Folic acid is given in higher dose in (a) Multifetal pregnancy (twins, triplets and so on), (b) Mothers with existing haemolytic anaemia like sickle cell disease. Folic acid along with vitamin B12 is recommended for pernicious anaemia, (c) Alcoholic mother and (d) Mother getting antiepileptic drugs (Where Folic Acid is metabolized rapidly.)

CONCLUSION

Abundance of scientific data based on clinical trials available to the public have reinforced the observation that risk of delivering a child with NTDs significantly decreases with ingestion of periconceptional folic acid. Folic acid is essential also to prevent megaloblastic anaemia of pregnancy, reducing chances of spontaneous abortion and IUGR. In September, 1992, the US Public Health Service made a strong recommendation that all women of childbearing age in US, who are capable of becoming pregnant, should consume 0.4 mg of folic acid per day. Relevant bodies in Canada also recommend this.

Recommendation from the UK Department of Health is that all women, who are planning a pregnancy, should be advised to take 0.4 mg (400 µg) folic acid as a daily medicinal or food supplementation from when they begin trying to conceive until the 12th week of pregnancy. Also, women who are having an offspring with NTD should be advised to take 5 mg (5000 µg) folic acid should per day. Finally, even prescribing folic acid should be free of charge.

Hence public awareness “to plan before you conceive and to take folic acid if you plan a pregnancy”, should be built up in India also. Fortification of cereals with folic acid requires initiative by Government sector which is promising.

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