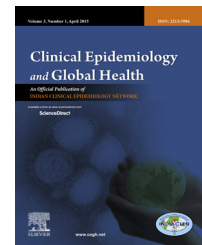


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Original Article

Epidemiological determinants of Folate deficiency among pregnant women of district Dehradun

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ABSTRACT

Background: Folate deficiency has been found to be associated with congenital birth defects like spina bifida, anencephaly, etc. Pregnant women have an increased need for folic acid (600 µg/day) to support the growth of the placenta and foetus and prevent birth defects.

Objectives: The present study was conducted to assess deficiency of serum folate among pregnant women and its epidemiological determinants.

Methods: A cross-sectional study was conducted in the Doiwala block of Uttarakhand state, a hilly state of the country, and a total of 95 pregnant women participated. Pregnant women were randomly selected from antenatal clinics organized at sub-centres and primary health centres. Blood samples were analyzed for serum folate by competitive immunoassay using direct chemiluminescent technology. Fully automated ADVIA Centaur XP Immunoassay system was used for analysis.

Results: Analysis of data showed that mean serum folate level among pregnant women was 10.1 ± 5.9 ng/ml (95% confidence interval 8.9–11.2). As per World Health Organization cut-off levels, a total of 28 (29.4%), 95% CI (20.2–38.5), women were having folate deficiency (≤ 5.9 ng/ml), and out of them 3 were having folate levels below 3 ng/ml (severe folate deficiency). 9 (9.4%) women had elevated levels (>20 ng/ml). 57 (60%) women were in the normal range (6–20 ng/ml).

Out of various biosocial determinants considered, education and economic status have shown significant association with folate deficiency. A significant difference was observed in the mean serum folate level among pregnant women living in joint and nuclear type of family. Mean serum folate levels showed a slight negative correlation with body mass index (Spearman's rho = -0.22 , $p = 0.03900$) and gestational age (correlation coefficient: $r = -0.26$, $p = 0.009$).

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Conclusion: It is concluded that higher level of education, living in joint family during pregnancy and availability of designated APL (Above Poverty Line) or BPL (Below Poverty Line) card are important determinants for better serum folate level and lower chances of folate deficiency.

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1. Introduction

Globally, each year, 3–4 lakh infants are born with neural tube defects (NTDs) like spina bifida, anencephaly, myelomeningocele (open spina bifida), craniorachischisis, spinal dysraphism and encephalocele.¹ The prevalence is approximately 1–5 per 1000 live births at global level.² In India, the overall birth prevalence of neural tube defects is 4.5 per 1000 total births (95% confidence interval (CI) 4.2–4.9), which is higher than global level.³

Folate is one of the components required for neural tube closure.⁴ Neural tube closure is a complex, inadequately understood morphogenetic process, which is accomplished by 28 days of gestation, before the woman realizes she is pregnant.⁴ Folate (the naturally occurring form) or folic acid (the synthetic form) is a member of the water-soluble B complex vitamins. Studies till date have shown decreased maternal folate levels in NTD-affected pregnancies. The decreased levels of serum folate could arise as a consequence of dietary deficiency, a genetic defect in the folate metabolism or both.⁵ A study conducted by Basu et al. in India reported 41.6% folate deficiency by measuring serum folate level among pregnant women,⁶ but this is the status reported 42 years ago. There has been very limited published data available on serum folate level among pregnant women in the recent past from the country.^{7,8}

Various researches have reported that the extent of potential nutrient deficiency during pregnancy may vary by demographic characteristics, such as younger maternal age and lower income and education.^{1,9} One of the underlying causes of dietary deficiency is increased requirement of folate during pregnancy due to changes in physiology and homeostatic control.^{4,10} Although increased requirement of folate should preferably be met through food sources, even within the developed world, it may be unlikely that pregnant and childbearing age women meet their needs for folate and other micronutrients, such as iron and calcium, through foods alone.^{10,11}

As the neural tube closure completes by the first month of gestation, adequate levels of folic acid are important during peri-conceptual period. Supplementation of peri-conceptual folic acid has already shown to decrease both the occurrence and recurrence of NTD, and approximately 75% of spina bifida and anencephaly are preventable by folic acid supplementation; however, many studies have reported¹² that there is very poor awareness and supplementation practices of folic acid among health providers and pregnant women. So even after being a very successful strategy, its effectiveness remains low in many community settings.

So, it becomes important to assess current level of folate deficiency among pregnant women along with its various determinants, so that besides putting emphasis on peri-conceptual folic acid supplementation, other determinants can also be considered to make comprehensive strategy for addressing the problem and reducing the NTDs occurrence.

2. Methods

The present research paper has developed out of the comprehensive intramural research project entitled “A KAP study on folic acid supplementation – Perspective of health providers & pregnant women and assessment of serum folic acid among pregnant women of Block Doiwala, District Dehradun”.

Study location: Uttarakhand is one of the newly formed states of the country (India). District Dehradun is one of the 13 districts of the state with totally six blocks. Out of six blocks, Doiwala block was randomly selected for the study purpose.

Study design, period and population: A cross-sectional study was conducted from August 2014 to August 2015.

Sample: For the overall study, it was estimated that a sample of 400 pregnant women would be required based on presumed prevalence of knowledge of folic acid as 50% (no previous data on the mentioned indicator was available from the region) with allowable error of 5% at 95% confidence level. However, due to limited financial resources, folate estimation was planned for the sub-sample of 100 women (25% of the total sample size). Out of the total 400 pregnant women who participated for the above-mentioned KAP study, as per systematic random sampling, every fourth woman was selected for blood examination after informed consent.

Exclusion criteria: Any woman found seriously ill or having diarrhoea, steatorrhoea and hyperemesis was excluded, as these diseases have been reported to vary the serum folate level.

Site selection and data collection: Pregnant women were recruited in the study from the antenatal clinics organized weekly at sub-centres (at village level) of the block. There were totally 23 sub-centres in the block. As on an average 6–7 pregnant women attend these antenatal clinics, hence all the women attending the clinic for the day were recruited for overall KAP study and from them blood sample was drawn for every fourth woman for the estimation of folate level. Totally, 100 blood samples were drawn.

Data were collected using pre-designed and pre-tested questionnaire, which was administered by the study investigators and field staff after 1 day of orientation. Questionnaire has included information regarding biosocial profile,

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