The relationship between maternal nutritional status and spontaneous abortion

J. NEELA, L. RAMAN

ABSTRACT

Background. The incidence of pregnancy wastage is high among poor women. Though the aetiology of spontaneous abortion is multifactorial, nutritional deficiency is considered to be an important contributory factor.

Methods. A case–control study was conducted to assess the relationship between maternal vitamin status and spontaneous abortion.

Results. The incidence of anaemia (15%), and riboflavin (84%) and folate deficiency (24.5%) were similar among the cases and controls. Vitamin A levels were higher in the study group compared to those in controls.

Conclusion. The results suggest that various nutrient deficiencies have no correlation with the occurrence of spontaneous abortion. The role of increased vitamin A levels needs to be studied further.

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INTRODUCTION

The incidence of pregnancy wastage including abortions is high in women from poor socio-economic groups. Maternal malnutrition (especially vitamin deficiencies) is considered to be an important factor contributing to spontaneous abortions by way of altering the germ cell morphology. Vitamin deficiencies and excesses have also been implicated in the genesis of congenital malformations especially neurotubal defects. Among these the important vitamins are vitamin A, riboflavin and folic acid. Vitamin A is required for the maintenance of normal epithelial tissue and for growth and bone development, vision and reproduction. Riboflavin (vitamin B1) acts as a coenzyme in humans and is essential for tissue respiration. Folic acid is essential for nucleoprotein synthesis and the maintenance of normal erythropoiesis. These vitamins are essential for tissue growth and respiration and, therefore, their deficiency might cause inadequate foetal development and loss. We performed a case–control study to assess the vitamin status of women who had had spontaneous abortions.

SUBJECTS AND METHODS

The study was conducted at the Government Maternity Hospital, Hyderabad. One hundred and fifteen women with spontaneous abortions in the first and second trimesters of pregnancy, who had come to the hospital for further care, formed the study group. An equal number of age, parity and gestational age-matched pregnant women attending the outpatient department (OPD) of the same hospital formed the control group. None of the controls had had spontaneous abortions. The data on socio-economic and educational status, obstetric history, especially regarding the present abortion and the associated problems, were recorded. Assessment of nutritional status was done using anthropometric indices, i.e. height, body-weight, mid-arm circumference (MAC) and triceps fat fold (FFT), which were recorded by standardized techniques. A blood sample (5 ml) was obtained to estimate the haemoglobin, vitamin A (colorimetry), folic acid (by microbiological assay using Lactobacillus casei as the organism), and riboflavin [using an enzymatic method measuring erythrocyte glutathione reductase (EGR) before and after stimulation] levels. The data were statistically analysed. Means were compared using the two sample Student’s t-test.

RESULTS

The nutritional anthropometric indices of the study group are given in Table I; there was no difference between the study group and controls. Table II shows the vitamin status of the study group. The mean haemoglobin levels were not significantly different among the two groups although the packed cell volume was significantly lower (p<0.05) in the study group compared to that in controls. Serum vitamin A levels were significantly higher (p<0.01) among the cases with a mean (SD) value of 53.6 (14.6) µg/dl compared to the controls [44.3 (15.6) µg/dl]. As the serum vitamin A levels were significantly higher in the study group, we tested them for differences at different gestational ages (Table III). There was a progressive increase in vitamin A levels with increasing gestational age among the study group. The difference between the study group and controls was significant at <12 weeks and >16 weeks of gestation (p<0.05) but not at 12–16 weeks of gestation.

The data were analysed giving deficit cut-off levels for each nutrient studied. The incidence of anaemia as indicated by a haemoglobin level of <11 g/dl was low (15%) in both the groups.

The cut-off value for the erythrocyte coefficient was 1.2 (a value above this indicates riboflavin deficiency). Eighty-four per cent were riboflavin-deficient in both the groups. For folic acid the cut-off value for deficiency was taken as whole blood folate <30 ng/ml and the percentage deficiency (25%) was similar in both cases as well as controls. The cut-off level indicating vitamin A deficiency was 30 µg/dl. None of the study group or controls had values below this level.

DISCUSSION

During pregnancy there is an increased nutritional demand both by the mother and the foetus and maternal undernutrition may be harmful to the foetus as well as the newborn. Serious undernutrition during pregnancy increases the chances of intrauterine growth retardation, prematurity and abortion—all possibly suggesting cellular malfunction. For example, during pregnancy, megaloblastic anaemia is common due to adverse changes in B12 and/or folate metabolism. These changes adversely affect the foetus, which is especially vulnerable to such injury.

Table I. Nutritional anthropometry of the cases and controls

<table>
<thead>
<tr>
<th>Group</th>
<th>Weight (kg)</th>
<th>Height (cm)</th>
<th>MAC (cm)</th>
<th>FTT (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cases</td>
<td>44.8 (7.62)</td>
<td>151.8 (5.33)</td>
<td>22.8 (2.65)</td>
<td>12.8 (4.52)</td>
</tr>
<tr>
<td>Controls</td>
<td>44.8 (7.83)</td>
<td>151.1 (5.91)</td>
<td>23.1 (2.42)</td>
<td>13.6 (4.92)</td>
</tr>
</tbody>
</table>

MAC mid-arm circumference  FTT triceps fat fold  All values are mean (SD)
**TABLE II. Vitamin nutrient status of the study group**

<table>
<thead>
<tr>
<th>Group</th>
<th>Haemoglobin (g/dl)</th>
<th>PCV (μg/dl)</th>
<th>Vitamin A (μg/dl)</th>
<th>Riboflavin as erythrocyte glutathione reductase (μg/dl)</th>
<th>Folic acid (ng/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Basal</td>
<td>Stimulated</td>
<td>EC</td>
<td>WBF</td>
<td>RBCF</td>
</tr>
<tr>
<td>Cases</td>
<td>11.1 (2.40)</td>
<td>32.1 (7.40)</td>
<td>53.6 (14.60)</td>
<td>66.0 (24.52)</td>
<td>97.0 (30.73)</td>
</tr>
<tr>
<td>Controls</td>
<td>11.7 (1.79)</td>
<td>34.5 (5.53)*</td>
<td>44.3 (15.62)†</td>
<td>62.5 (20.90)</td>
<td>99.3 (25.90)</td>
</tr>
</tbody>
</table>

**TABLE III. Mean (SD) vitamin A levels (μg/dl) of the study group**

<table>
<thead>
<tr>
<th>Gestational age in weeks</th>
<th>Cases</th>
<th>Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;12</td>
<td>50.5 (12.97)*</td>
<td>43.45 (15.76)</td>
</tr>
<tr>
<td>12–16</td>
<td>54.0 (12.36)</td>
<td>45.15 (16.37)</td>
</tr>
<tr>
<td>&gt; 16</td>
<td>65.0 (17.34)*</td>
<td>45.66 (15.88)</td>
</tr>
</tbody>
</table>

* p<0.05
† p<0.01

Several researchers have associated folic acid deficiency with abortion. 11,12 The aetiology of some abortions is faulty folate metabolism in early pregnancy, producing irreversible injury to the foetus and placenta. 13 Others have not been able to detect any significant relationship between serum and RBC folate levels and abortion. 14

In western countries the incidence of riboflavin deficiency during pregnancy is low. 15 In two studies, no correlation was found between the riboflavin status of the mother and the outcome of pregnancy even when riboflavin deficiency was present. 16,17

In the present study, the levels of the two vitamins (riboflavin and folic acid) were not different among the cases and controls. Even the percentage deficiency of these two vitamins (riboflavin 34% and folic acid 25%) was similar among the two groups.

Earlier studies 18 have shown a progressive increase in serum vitamin A levels from the first to the second trimester followed by a decrease in the third trimester. In the present study vitamin A showed an increase with gestation. At any gestational age, the vitamin A levels among cases were higher than those among controls. Whether this elevation itself is responsible for causing abortion needs further study. It can be speculated that while vitamin A is needed in adequate quantities for cell wall integrity, its excess might be causing an opposite effect, thus leading to abortion.

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REFERENCES