

International Journal of Clinical Obstetrics and Gynaecology

ISSN (P): 2522-6614
ISSN (E): 2522-6622
© Gynaecology Journal
www.gynaecologyjournal.com
2021; 5(1): 287-290
Received: 25-10-2020
Accepted: 19-12-2020

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Nutritional supplements before and during pregnancy and its effects on maternal and fetal outcome

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DOI: <https://doi.org/10.33545/gynae.2021.v5.i1e.828>

Abstract

Introduction: Micronutrients, vitamins and minerals are essential for normal biologic activity. Pregnancy itself can exacerbate micronutrient deficiencies leading to maternal and fetal health consequences. As micronutrients are required in each stage of gestation, their supplementation can significantly reduce many maternal as well as fetal complications.

Aim: To examine the potential role of nutritional supplements in preconception period and during pregnancy and the associated maternal and fetal outcome.

Methodology: A retrospective study done in the department of obstetrics and gynecology of Ramaiah Medical College and Teaching Hospital, Bangalore. 500 pregnant women were enrolled for the study

Results: In the data obtained during the period of study incidence of normal vaginal delivery was 53%, preterm vaginal delivery 9%, C section 38%. Maternal and fetal complications were noted in patients taking irregular treatment.

Conclusion: Regular intake of nutritional supplements can help in achieving better maternal and fetal outcome.

Keywords: Micronutrients, iron, omega-3 fatty acids, folic acid

Introduction

Micronutrients, vitamins and minerals are essential for normal biologic activity. Pregnancy itself can exacerbate micronutrient deficiencies leading to maternal and fetal health consequences. As micronutrients are required in each stage of gestation, their supplementation can significantly reduce many maternal as well as fetal complications. Maternal nutritional and metabolic status at the time of conception may be even more important for fetal development. Organogenesis occurs early in the first trimester before many women are aware of the pregnancy. Hence, women who may become pregnant or who are attempting to conceive should optimize their nutritional status before pregnancy.

Micronutrients helps in avoiding adverse pregnancy outcomes like low birth weight, stillbirth, fetal growth restriction etc. in women who are devoid of adequate nutrition [1]. It is a proven fact that folic acid supplementation in pregnancy significantly reduces the risk of neural tube defects. Studies have also quoted that folic acid helps in appropriate growth of placenta and reduces risk of developing congenital heart disease [2]. A women with a prior child with a neural tube defect can reduce the 2-5 % recurrence risk by more than 70% with daily 4mg of folic acid supplements preconceptionally and during the first trimester [3]. Iron deficiency anemia is a common health condition worldwide. Inadequate intake during pregnancy causes iron deficiency anemia. Daily folic acid and oral iron supplementation in pregnancy with 400mcg (0.4 mg) of folic acid and 30 to 60 mg of elemental iron is essential to prevent preterm birth, low birth weight, puerperal sepsis and maternal anemia. Intermittent folic acid and oral iron supplementation with 2800 mcg (2.8 mg) of folic acid and 120 mg of elemental iron once a week improves pregnancy outcomes, if compliance with daily iron is unacceptable due to side-effects and in areas with prevalence of anemia of less than 20% among pregnant women [4]. Calcium is an important supplement for fetal growth and development. In areas with low calcium intake, providing the pregnant mother with daily 1.5 to 2 gm of calcium helps in reducing the risk of pre-eclampsia [5]. Omega-3 fatty acids are essential nutrients that can only be supplied only from the diet. The amount of requirement preconceptionally or during pregnancy has not been established yet [6]. The exact mechanism of improved pregnancy outcome by micronutrients supplementation has not been completely understood [6].

An improvement in generalized immune function of the pregnant women, reduction in the incidence of infections and an improved anabolic processes and energy metabolism, an improved stress response, expansion of plasma volume secondary to fluid retention might be some of the mechanisms by which these micronutrients work [6]. An increased absorption of iron related to intake of riboflavin and vitamin C, helps in improvement of hemoglobin levels [6].

In the present study we have observed the beneficial effects of multiple nutritional supplements in terms of improved fetal outcome and reduced maternal complications.

Methodology

This was a retrospective study done in the Department of Obstetrics and Gynaecology of Ramaiah Medical College Teaching Hospital, Bangalore. A total of 500 patients irrespective of their parity index were included in this study who fulfilled the inclusion criteria.

Inclusion criteria

- AGE 18-40yrs
- Spontaneous conception

Exclusion criteria

- Known case of nutritional deficiencies
- Past history of medical illness
- Multiple pregnancy
- Obstetric complications in previous pregnancies
- ART conception

The patients detailed history was noted and information regarding intake of folic acid supplements 400mcg, iron supplements in form of ferrous sulphate 200mg, calcium 1gm, multivitamins, multimineral, omega 3 fatty acid supplements preconception and during conception. The outcome of the pregnancy was noted. Along with that antenatal and neonatal complications were noted in patients who didn't receive adequate antenatal supplements.

Results

A total of 500 patients, 240 were primigravidae and 260 were multigravida were included in this study who fulfilled the inclusion criteria. This study included intake of folic acid, iron, and omega fatty acids, multivitamins and multimineral. Figure 1 shows the distribution of various antenatal supplements preconception and across the three trimesters irrespective of their parity. Out of total number of patients, only 3% consumed iron preconceptionally. 1.2%, 90.4% and 94.6% consumed iron during 1st, 2nd and 3rd trimesters respectively. Only 20% consumed folic acid preconceptionally. 93%, 17.6% and 6.6%

consumed folic acid across the first, second and third trimester respectively. Only 1.2% consumed calcium preconceptionally. 94.2% and 96.4% consumed calcium during 2nd and 3rd trimesters respectively. None consumed omega-3 fatty acids preconceptionally. 4.4% and 11.4% consumed iron during 2nd and 3rd trimesters respectively. Only 0.4% consumed multivitamins preconceptionally. 0.4%, 19.8% and 40.8% consumed during 1st, 2nd and 3rd trimesters respectively. None consumed multivitamins preconceptionally. Only 6.4% consumed during 3rd trimester.

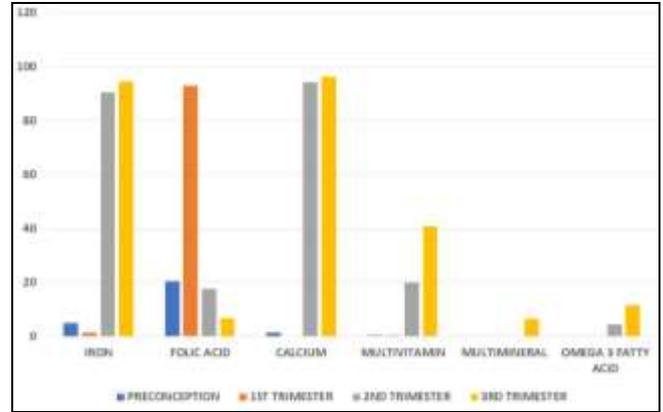


Fig 1: Distribution of antenatal supplements

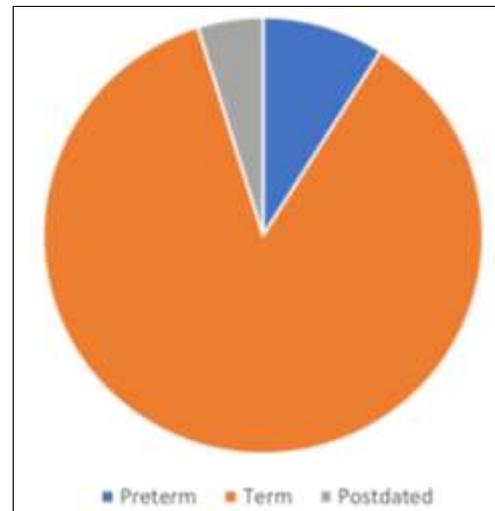


Fig 2: Outcome of pregnancy

Figure 2 demonstrates the outcome of the pregnancy among the group studied. Out of 500 patients, 45 patients (9%) delivered preterm, 431 patients (86.2%) delivered term and 24 patients (4.8%) were post-dated.

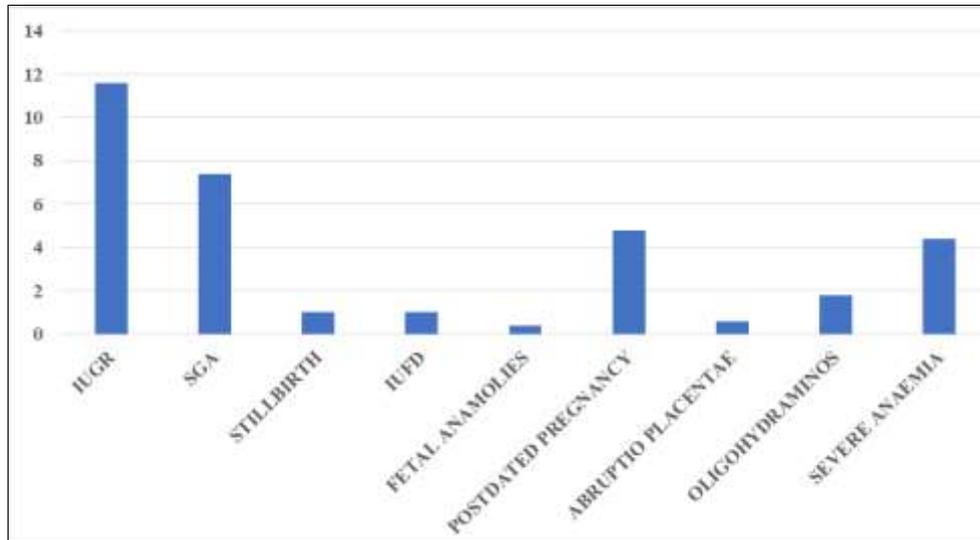


Fig 3: Antenatal complications

Figure 3 shows the rate of different complications encountered during the course of the study i.e IUGR (11.6%), SGA (7.4%), Stillbirth (1%), IUFD (1%), fetal anomalies (0.4%), abruptio

placenta (0.6%), oligohydramnios (1.8%), post-dated pregnancy (4.8%), severe anaemia (4.4%).

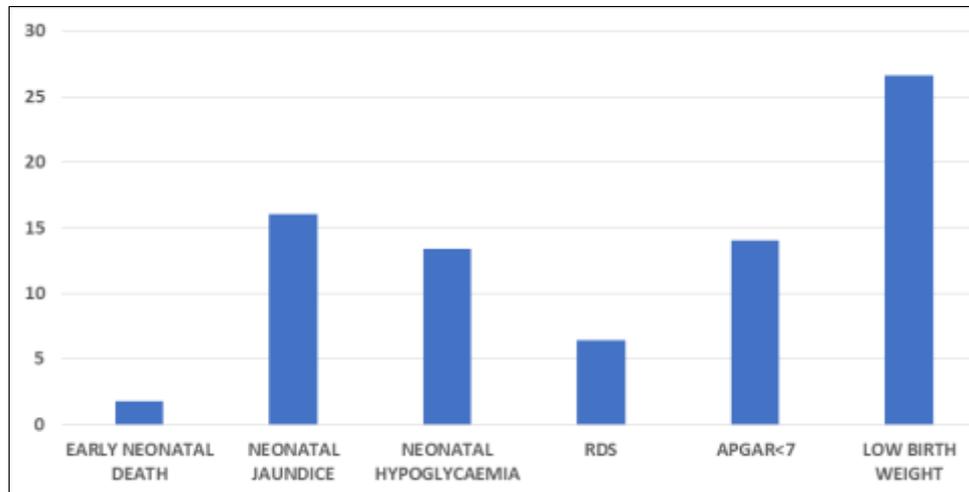


Fig 4: Neonatal complications

Figure 4 demonstrates neonatal complications which were early neonatal death (1.8%), low birth weight <2.5kg (26.6%), neonatal jaundice (16%), neonatal hypoglycaemia (13.4%), respiratory distress syndrome (6.4%), APGAR score <7(14%).

Discussion

Among the population studied complications were observed frequently in those who were not taking supplements regularly or not taking at all. Incidence of preterm vaginal delivery in the present study was 9% which was significant in the subjects not taking folic acid supplement. Also, the incidence of small for gestational age babies (7.4%) was increased in the subjects not taking folic acid regularly. Incidence of IUGR (11.6%) was associated with low or irregular iron intake. Incidence of severe anemia (4.4%) was also associated with low or irregular iron intake. In comparison to a study done by Aamer Imdad *et al.*, wherein the conclusion drawn from 30 studies was that daily iron supplementation reduced the incidence of anaemia at term by around 69% when compared with placebo(RR 0.31 [95% CI 0.22, 0.44])⁷. They also found that there was a reduction of 20% in incidence of low birth weight (RR 0.80 [95% CI 0.71, 0.90])

in women who received daily iron supplementation ^[7]. Their conclusion of reduced incidence of anaemia and low birth weight is consistent with our study findings.

In the present study intake of omega 3 fatty acid was observed in 2nd trimester (4.4%) and 3rd trimester (11.4%). None of the subjects were taking omega 3 fatty acids before pregnancy and during 1st trimester. In subjects taking omega 3 fatty acid in 2nd and 3rd trimester fetal outcome in terms of birth weight was found to be good. In a study by Hania Szajewska *et al.* they concluded from six RCTs that n-3 LC-PUFAs supplements in pregnancy was associated with a comparatively longer duration of pregnancy (WMD: 1.57 d; 95% CI: 0.35, 2.78 d) than the control group patients ^[8].

In Cochrane review by G Justus Hofmeyr *et al.*, they drew conclusion that the average risk of hypertension in pregnancy and pre-eclampsia was decreased with calcium supplements ^[9]. The effect was greatest for group of women with low calcium intake and women who have an increased risk of developing pre-eclampsia ^[9]. However in our study the incidence of patients having hypertension in pregnancy and pre-eclampsia were insignificant to come to a conclusion.

Multivitamin intake was observed more in 2nd and 3rd trimester 19.8% and 40.8% respectively. Symptomatic improvement was seen in the mentioned subject group after multivitamin intake. Multimineral intake was observed in 6.4% in 3rd trimester. Neonatal birth weight was found to be good in the above group. Iron, calcium and folic acid are routinely used as antenatal supplements but the optimal use of omega-3 fatty acids and multivitamins are still under study. Some authors support their routine use whereas some couldn't conclude any additional benefit from them. In our study, we have a favorable outcome with relation to routine supplementation of micronutrients and hence their use can be recommended.

Conclusion

Maternal nutrition is an important aspect of present-day antenatal care. Adequate nutrition in preconception period as well as during pregnancy helps in assuring favorable fetal outcomes. The optimal dose and efficacy of micronutrients varies in various studies but all recommend their use in all trimesters as well as preconceptionally. Keeping this in mind as well as with our study results, we can hereby conclude that micronutrients help in improving maternal and fetal outcome.

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