ORIGINAL ARTICLE

Impact assessment on DFS supplementation Post NHE on nutrient intake of critically anemic pregnant mothers in a tribal set up of Gujarat

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Abstract

Introduction: Adequate nutrition is essential during pregnancy to ensure optimal fetal growth. Especially maternal Iron and Iodine deficiency have negative and irreversible effects of the developing fetus. Double Fortified Salt (DFS) with both iodine and iron was later proposed by NIN to be simple and inexpensive public health strategy to control iron and iodine deficiencies. Efficacy trials were run by Nair et al., 2007 using DFS showed a beneficial effect on population by an increase of 4-5% change in the iron status of the highly malnourished subjects. **Objectives:** The study has focused on the impact of DFS along with nutrient intake on critically anemic pregnant mothers in tribal areas of Jhagadia with 58% of preterm deliveries. **Materials and Methods:** Present study was carried out in Bharuch District. From this area 135 pregnant mothers were enrolled. NHE regarding consumption of DFS and dietary improvement was provided. Reinforcement was carried out after 1 month of supplementation with DFS. **Results:** Out of 135 subjects, 40% were UIC deficient, 75% were moderately anemic, 15% and 10% were mild and severely anemic respectively. DFS (1mg iron and 40ppm iodine/g) supplementation and Nutrition Health Education for 2 months showed statistical non-significant change in UIE and iron status of the pregnant mothers. Significant increment in both macro and micro nutrient intake from pre to post intervention period was observed. **Conclusion:** Owing to the fact that dietary contribution of Iron was only 7mg/day, it is clearly evident that even DFS and IFA supplementation showed no significant improvement in iron status. Dense nutrition is the key element for improving maternal nutritional status.

Key Words

DFS – Double Fotified Salt; NHE- Nutrition Health Education; critical anemia; pregnant mother; tribal; Gujarat

Introduction

Adequate nutrition is essential during pregnancy to ensure optimal fetal growth. (1) While Micronutrient Initiative (MI) and United Nations Children's Fund (UNCEF), 2004 reported that a wide range of micronutrient deficiencies in pregnancies are commonly found in developing countries especially in South East Asian Regions (SEAR).WHO magazine (April 2008) states that India has the largest number of births per year (27 million) in the world, with its high maternal mortality of about 300-500 per 100,000 births. (2)In tribal India teenage pregnancies after marriage have social approval but have an adverse impact on maternal mortality and perinatal morbidity. Pregnancy in very young women is generally considered to be a very high risk event, because teenage girls are physically and psychologically immature for reproduction. Iron Deficiency Anemia (IDA) and Iodine Deficiency Disorders (IDD) are the two major micronutrient deficiencies of public health magnitude of India. Consequences of IDA in pregnant women include increased risk of low birth weight or premature delivery, pre natal and neonatal mortality,

inadequate iron stores for the newborn, lowered physical activity, fatigue and increased risk of maternal morbidity. It is also responsible for almost a quarter of maternal deaths. IDD during pregnancy is associated with low birth weight (LBW), increased likelihood of stillbirth, spontaneous abortion and congenital abnormalities. Iron and Iodine deficiency have negative and irreversible effects of the developing fetus as well as these retards the cognitive functioning of developing children. There is a substantial amount of evidence showing that maternal iron deficiency anemia early in pregnancy can result in low birth weight subsequent to preterm delivery. (3) Significant reduction in maternal deaths and better fetal outcome has been observed when hemoglobin during pregnancy is at least 8g/dl. According to NFHS 3 data, Gujarat being one of the richest states of India prevalence of anemia in pregnant women has been shown to be 60.8%. (4) Many strategies like increasing the diversity of food consumption, food fortification, Supplementation etc have shown positive impact on preventing and controlling micronutrient malnutrition. Several decades ago, NIN successfully demonstrated iron fortified common salt as a feasible and effective programme to deliver iron to the people. As IDA and IDDs coexist in many regions, Double Fortified Salt (DFS) with both iodine and iron was later proposed by NIN to be simple and inexpensive public health strategy to control iron and iodine deficiencies. DFS provides 1mg of elemental iron and 40µg iodine with KI and 30µg with KIO_3 per gm of salt. Keeping this in view current study was planned for a follow up analysis. From ICMR and other state reports (GOG, 2004), it has been known that percentage of severity exist more in Bharuch and nearby villages. Hence the broad objective of present study was focused in this area aiming to see the impact of DFS in critically anemic and iodine deficient pregnant women in tribal areas of Jhagadia.

Aims & Objectives

- Provide NHE to improve nutritional status
- To observe if there is an improvement in iron status of the subjects after DFS supplementation.
- To observe the pattern of food intake.

Material and Methods

Existing and ongoing programmes of Government of Gujarat showed good output. Hence these systems were approached for our study. To cover all the pregnant mothers of Jhagadia district, PHC's from Jhagadia, Govali, Avidha and Bhalod were purposively selected. Depending on 10% prevalence of Iodine deficiency, the calculated sample size was 135 at 95% confidence interval, 20% relative precision. The study was conducted in three phases. In the first phase anthropometric measurements (height and weight), urine and household salt sample collection and hemoglobin estimation (Sahli's method) of all the 135 mothers (23 from Govali, 44 from Jhagadia, 37 from Avidha and 31 from Bhalod) were done. Basic information regarding Knowledge, Attitude and Practices (KAP), usage, consumption and storage of iodised salt, frequency of consumption of certain foods like goitrogens, iron and iodine rich foods were also collected. In phase two based on the estimated Urinary Iodine Excretion (UIE) by Sandell-Kolthoff method (1937) (5) modified by Ohashi and Karmarkar et al., 2000, (6) the subjects were classified into two groups. In the first group both UIE and Iron deficient mothers (n=54) and in the second group only iron deficient mothers (n=81) were enrolled. The first group was supplemented with both DFS and IFA, whereas the second group was given Iodized salt and IFA. Both the groups were provided Nutrition Health Education (NHE) specifically pertaining to the use and storage of double fortified salt, its iodine, and iron rich foods, its advantages, consequences of deficiency etc. Reinforcement was carried out after 1 month of supplementation with DFS. However there were 51 drop outs due to several reasons, like preterm delivery, still birth or those mothers who migrated to their maternal places etc. In the last phase post data on UIE, Hb along with impact of counseling was evaluated by analysis of KAP of remaining 84 mothers, regarding the storage and use of DFS.

Results

The socio demographic data clearly shows that majority of pregnant mothers enrolled in the study were Hindus (89.3%), and 62% of all the women lived in joint families. Most of the participants belong to the age group of 23-27 years. The birth outcome revealed 58% preterm deliveries. About 40% of the women were primiparous and 12% were under high risk for the incidence of Low Birth Weight (LBW). Majority of mothers (72%) were underweight. Low weight before pregnancy and inadequate weight gain during pregnancy are significantly correlated with LBW. (7, 8) About 75% mothers were

moderately anemic (Hb-7-9.9g/dl) while 14% and11% were mild (Hb ≥10 and above) and severely anemic (Hb<7) respectively.

Out of all the 84 mothers 45.13% of the mothers were iodine deficient, of which 38% and 41% were severely and moderately iodine deficient. Iodometric titration of household salt samples showed 53.2% of the total households were using optimally Ioidised salt >30ppm. NHE on practice of using salt improved by 42%.

DFS supplementation for 2 months showed statistically significant increment in median UIE value of iodine deficient subjects.

24 hour diet recall showed significant impact of NHE on the increased intake of most of the nutrients for mothers. Per day energy consumption increased from 666 kcal to 1117 kcal.

Discussion

Studies conducted in southern India by Zimmermann et al., suggested that, the prevalence of anemia decreased from 16.8% to 7.7% in the experimental group. The median UIE levels increased significantly p<0.001 in the experimental group after DFS supplementation. (9)

Intervention (NHE) in the current study showed rapid improvement in the practice of using salt during cooking. Percentage of most desirable practice of adding salt at the end of cooking increased from 35% to 77% which is a positive change as it helps in retention of iodine.

Looking at the hemoglobin status of pregnant mothers, there was no significant impact of the DFS supplementation and NHE on improving the same. This may be due to increased iron needs during pregnancy especially third trimester where the fetal requirements increase. Efficacy trials were run by Nair et al., 2013 using DFS showed a beneficial effect on population by an increase of 4-5% change in the iron status of the highly malnourished subjects. (10)

A study conducted by Toteja et al., 2006 in 16 districts of India revealed that 84.9% of pregnant women were anemic (Hb< 10g/dl); 13.1% and 60.1% were severely (Hb< 7g/dl) and moderately (Hb 7-10g/dl). (11)

In our study, owing to the fact that dietary contribution of Iron was 7mg/day, it is clearly evident that even though DFS provided 10 mg/day Iron along with 120mg of IFA, the observed non-significant improvement in iron status clearly indicated, dense nutrition is the key element and dietary patterns should be improved variably at the very onset of pregnancy.

Nutrition Health Education helps to bring a positive behavioral change in the subjects. Our study showed nutritional deficiencies of both macro and micro nutrients were common since the subjects belonged to below poverty line. Various studies in developing countries show epidemiological and biological evidences where acute or chronic nutritional deficiencies can contribute to severe maternal morbidity. Therefore, it was our interest to understand the nutritional pattern of the study subjects.

Thus the observation on frequency of food consumption from pre to post intervention in pregnant women showed increased consumption of wheat flour, rice flakes, Bajra, Jowar, milk from 5%, 12%, 5%, 58%, 52% to 12%, 47%, 35%, 71%, 78% respectively. It was further observed total calorie intake increased from 666Kcal to 1117 Kcal (p<0.001). Similar significant increase was observed in intake of carbohydrates (122gms to 204 gms), protein intake improved at (p<0.01) from 39gms to 60 gms. Thus it can be stated that appropriate care, support and timely interventions with behavior change communication can bring a potential upliftment to the nutritional status of an expectant mother.

Conclusion

It is evident from the study, though the total intake of iron was 137 mg, it was not meeting body's excess needs of pregnancy. Based on the intake of 10gm salt (10mg iron), it is concluded that a minimum of 10mg DFS is playing a minor contributory role which shows significance at (p<0.05) level along with the diet for iron deficient subjects. Thus it can be stated that DFS at a long run along with nutrient dense diet can make contribution to pregnant mothers even in critical anemia but when supplemented with DFS and IFA tablets at the reproductive age of women; it can bring large positive impact on future mothers.

Recommendation

- Intense nutrition counseling should be provided to all pregnant mothers.
- Link workers should be trained to promote and encourage mothers to avail optimal ANC services.
- Multiple micronutrient rich foods should be apart of the program by government for all pregnant mothers.

- Intense monitoring of maternal child health programs should be followed.

Limitation of the study

- Reachability to the population.
- Transportation to the interior part of the villages.

Relevance of the study

- Regular iron release on a daily basis by DFS through food helps a sustainable availability for optimal absorption.
- No side effects reported since the vehicle is best acceptable food commodity.

Authors Contribution

NS: Concept, design, finalizing the article, BS: Article drafting, SL: Data collection

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References

1. PROMOTING OPTIMAL FETAL DEVELOPMENT, Report of a Technical Consultation. s.l. : WHO, 2006.
2. India needs political will to reduce maternal mortality: WHO. [Online] 3 4, 2008. http://www.thaindian.com/newsportal/health/india-needs-political-will-to-reduce-maternal-mortality-who_10033862.html.
3. Bondevick GT, Liemagnarulstein RT, Gunnuarkavale. Maternal haematological status and riskof low birth weight and preterm delivery in Nepal. 5, pp 402-408, s.l. :ActaObstertricia et GynecalogicaScandinavica, 2001, Vol. 80.
4. Ministry of Family and Health Welfare, Government of India. National Family Health Survey (NFHS-3), Fact Sheet India .Mumbai : International Institute of population Sciences, 2005- 2006.
5. Sandell E B, Kolthoff I M. Micro determination of iodine by a catalytic. 1:9-25, s.l. :MichrochimicaActa, 1937, Vol. 1.
6. Ohashi T, Yamaki M, Pandav CS, Karmarkar MG, Irie M. Simple microplate method for determination of urinary iodine. 4:529-36, s.l. :ClinChem, 2000, Vol. 46.
7. Leader A, Wong K H and Deitel M. Maternal nutrition in pregnancy. s.l. : A reveiw CMA journal , 1981, Vols. 125: 545-549.
8. Negger Y, Goldenberg R L. Some Thoughts on body mass index, Micronutrient Intakes and Pregnancy Outcome. s.l. : American Society for Nutritional Sciences, 2003, Vols. 133 : 170S-173S.
9. Zimmermann, Michael B. Iodine deficiency in Pregnancy and the effects of maternal Iodine supplementation. (suppl):6685-725, s.l. : The American Journal of Clinical Nutrition, 2008, Vol. 89.
10. Nair. S, Joshi. K, Chitre. N. Impact of Double Fortified Salt on Iron and Iodine deficient school children (6-12 years) of rural Vadodara. 2141-2316 (h5 index of 9), s.l. : Journal of Puplic Health and epidemiology, 2013.
11. Toteja GS, Singh P, Dhillon BS, Saxena BN, Ahmed FU, Singh RP, Prakash B, Vijayaraghavan K, Singh Y, Rauf A, Sarma UC, Gandhi S, Behl L, Mukherjee K, Swami SS, Meru V, Chandra P, Chandrawati, Mohan U. Prevalence of anemia among pregnant women and adolescent girls in 16 districts of India. 4:311-315, s.l. : Foods and Nutrition Bulletin, 2006, Vol. 27.

Tables

TABLE: 1 URINARY IODINE LEVELS OF SUBJECTS BEFORE AND AFTER DFS SUPPLEMENTATION

Subject	Median UIE (µg/l)			Statistical t-value
	Pre	Post	Difference	
Deficient subjects	91.1	105.70	14.6	0.942
Sufficient subjects	262.13	212.93	49.13	3.248**

(**P<0.01)

TABLE: 2 PREVALENCE OF ANEMIA AMONG PREGNANT MOTHERS BEFORE AND AFTER INTERVENTION.

Subject	Mean Hb/dl		Difference
	Pre	Post	
Deficient Subjects	8.00	8.03	0.036(NS)
Sufficient subjects	8.82	8.51	0.3*
Overall	8.43	8.28	0.15 (NS)

(*P<0.05)

Figures

FIGURE 1DIETARY PROTEIN, FAT AND CARBOHYDRATE, IRON, VITAMIN C INTAKE IN PRE AND POST INTERVENTION IN COMPARISON TO RDA