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ORIGINAL ARTICLE

EFFECT OF IRON SUPPLEMENTATION AND NUTRITIONAL EDUCATION AMONG A GROUP OF ANEMIC PREGNANT WOMEN ON THEIR PERINATAL OUTCOME IN RIYADH

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ABSTRACT: Anemia is an important public health problem worldwide and the most vulnerable groups are pregnant women and their children. Anemia is defined by the World Health Organization as hemoglobin levels of less than 11 g/dL. Maternal anemia in pregnancy is commonly considered as a risk factor for poor pregnancy outcome. So, the provision of iron supplements and educational intervention to pregnant women is one of the most widely practiced public health measures. The aim of this study was to investigate the effect of iron supplementation and nutritional education among anemic pregnant women on their perinatal outcomes. The research design used in this study is cross sectional, the settings are; King Saud Medical Complex & Yammamah maternity hospital. A total number of 100 pregnant women in their beginning of last trimester was selected and followed until delivery. Women with a past history of preterm delivery were excluded. Anemia was defined as hemoglobin level of < 11 g/dl. in current pregnancy. Women were interviewed in the outpatient by using interview questionnaire sheet and given oral iron, nutritional education sessions. Also, she interviewed on the day of delivery and the data from the interview and medical records (Apgar score, weight, mode of delivery & hemoglobin level) were recorded on a pre-designed questionnaire. The results of this study revealed that 90 % of pregnant women had Hb less than 11 gm/ dl in the last trimester so, after implementation of educational intervention session and iron supplementation, most of the study sample recorded increase in Hb concentration and improve their perinatal outcomes at delivery. Conclusion: Iron intake, both from diet and supplements, during the third trimester of pregnancy was associated with higher Hb level at delivery and improve pregnancy outcomes it was recommended that, educational intervention session and prophylactic iron supplementation must begin early in pregnancy to reduce iron deficiency anemia during pregnancy. Further study is needed to reconfirm this finding.

KEYWORDS: Anemia, pregnancy, prenatal outcomes

INTRODUCTION

Iron-deficiency anaemia is one of the most prevalent and potentially serious forms of nutrient deficiency anemia in the world (Schwartz and Thurnan, 1995; Colen, 1989). Anaemia in pregnancy is defined as a hemoglobin level of less than 11.0g/dl (Usanga *et al.*, 1994). Iron-deficiency anaemia is one of the direct and indirect causes of maternal mortality and can only be arrested by early detection and management during antenatal visits (Iloabachie and Meniru, 1990). IDA affects 1 billion people worldwide and WHO, estimates that 52.0 % of pregnant women and 39.0 % of infants under four are anemic in developing countries, compared with 22.7% and 20.1 % in developed countries (WHO, 2001a). Also, it is estimated that anemia accounts for 3.7% and 12.8% of maternal deaths during pregnancy and childbirth in Africa and Asia, respectively (Khan *et al.*, 2006).

In Saudi Arabia, a study by Mahfouz *et al.*, (1994) showed that prevalence of anemia among pregnant women was 31.9% Based on blood hemoglobin level in the Asir region. Also, reported anemia of 22.9% in the Taif among pregnant women whereas (Madani *et al.*, 1995) reported anemia of 25.6% in Jeddah City (Ghaznawi and Hussein, 1988). Maternal anaemia in pregnancy is commonly considered a risk factor for poor pregnancy outcome and can result in complications that threaten the life of both mother and fetus (Anonymous, 2008). Such complications as preterm labor, delivery

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through caesarean section, is more susceptible to infection may tire easily, with increased chance of preeclampsia and postpartum hemorrhage. Healing of an episiotomy or an incision usually delayed and if the anemia is severe (Hb less than 6g/dL), cardiac failure may ensue. On the other hand, there is evidence of increased risk of low-birth-weight babies, infant mortality and prediction of iron deficiency in infants after 4 months of age (Brabin *et al.*, 2001a; Brabin *et al.*, 2001b). When diagnosed early in pregnancy, good management helps to prevent these and other resultant complications and to ensure the optimal health of the mother and the newborn (Khan *et al.*, 2006; Scholl and Hediger, 1994).

Iron balance in early pregnancy, only the basal iron requirement (0.8mg/day or 6% of the daily dietary iron intake) is needed. Extra iron is required for expansion of red cell mass in the second trimester while more iron is needed for the developing fetus and placenta in the third trimester (Barret *et al.*, 1994). Inadequate dose of iron supplements and defective absorption have been recognized as major factors, among others, responsible for anaemia being a major public health problem (Shatrugna *et al.*, 1999). Overall, a pregnant woman needs about 2 to 4.8 mg of iron per day (Mukherji, 2002).

The woman must consume 20 to 48 mg of dietary iron to absorb this quantity of iron daily. Thus, the amount of iron absorbed from diet, coupled with that mobilized from body iron stores, is usually insufficient to meet the demands imposed by pregnancy. This is true even though the bioavailability of iron from the gastrointestinal tract is moderately increased during pregnancy. Therefore, iron supplementation during pregnancy is recommended universally even in non-anemic women (Mukherji, 2002). Internationally, oral iron supplementation is the most common way of treatment, and dose depends on severity of condition. Oral iron preparations given prophylactically consist of one of the iron salts, either alone or in combination with folic acid (Anonymous, 2004). Iron deficiency anemia treated with a daily ferrous iron supplement of 60-120mg, when the hematocrite becomes normal for the stage of pregnancy, the dose of iron decreased to 30 mg per day (CDC, 1998).

Strategies to increase iron intake and reduce iron loss are essential in reducing IDA. Despite much research into the efficacy of supplementation schemes in reducing IDA (Coutinho *et al.*, 2005; Davidson and Nestel, 2004), an area somewhat less explored is that of maternal nutrition education. Education has had an impact in reduction of other micronutrient deficiencies (Lanerolle and Atukorala, 2006) and regarding iron-deficiency, research has shown that maternal nutrition education can increase both dietary iron intake and hemoglobin levels in pregnant women. Education and supplementation is more effective than either approach alone (Kapur *et al.*, 2003).

Pregnant woman should be encouraged to eat an iron-rich diet during antenatal care to prevent anemia, she must balance iron requirements and intake. Although the rate of absorption of iron increases during pregnancy, it is still important to select foods high in iron to increase the daily intake. Lean meats, dark green leafy vegetables, eggs, and whole grain and enriched breads and cereals are the foods usually depended on for their iron content. Other iron sources include dried fruits, and legumes. Iron absorption is generally higher for animal products than for vegetable products. Iron is best absorbed in an acid medium. Therefore, advise women to take iron supplements with orange juice or a vitamin C supplement (Bothwell, 2000).

Iron supplementation and maternal nutrition education during pregnancy must be practiced to prevent maternal anemia, and help to improve reproductive outcomes. Therefore, the present study is aimed at investigate the effect of iron supplementation and nutritional education among anemic pregnant women on their perinatal outcomes.

METHODOLOGY

2.1. Research Design

Prospective experimental design was utilized in this study.

2.2. Research Question

1-What are the effects of iron supplementation & nutritional education among anemic pregnant women on their neonatal outcomes?

2.3. Setting

The study was carried out in two different settings; King Saud Medical Complex, Maternity Hospital and Yamamah Maternity Hospital in Riyadh.

2.4. Subjects

Subjects consisted of 100 anemic pregnant women seen at the end of 2nd and beginning of their 3rd trimester and fulfill the following criteria:

1- Attend the outpatient clinic at the end of 2nd or beginning of their 3rd trimester.

2- Their age range between 20 and 35 years.

3- The anaemic group was defined as having hemoglobin levels below 11 g/dl during the current pregnancy

4- Singleton pregnancy.
5- Good past medical & obstetrical history.

2.5. Tools of data collection
Two tools were utilized in this study:

2.5.1. Interview Questionnaire
It includes information about maternal age, residence, marital condition, economic condition, educational level, medical obstetrical & current pregnancy history; especially hemoglobin level.

2.5.2. Observational check list
It includes information related to outcomes e.g., maternal hemoglobin level at delivery, method of delivery, gestational age, Apgar score, birth weight, postpartum complications.

2.6. Pilot Study
A pilot study was conducted on 10 pregnant women, to test feasibility of tools and time required to be applied. Simple modification was done by omission of some items of the interview questionnaire sheet that they were not consistent with this study. Content, validity was done to ensure validity of the tools.

2.7. Administrative design
Before the conduction of the pilot study as well as the actual study, an official permission was obtained from the responsible authorities.

2.8. Procedure
Once official permission was obtained from the responsible authorities, the aim and the nature of the study were explained to the subjects who fulfill the criteria &agree to participate in the study and an oral consent was obtained. Tools utilized to collect the desired data were filled through individual interview at ante-natal outpatient clinic and antenatal inpatient wards. All subjects were interviewed individually and assured that all their data are highly confidential, anonymity was also assured through assigning a number for each questionnaire instead of names to protect their privacy. About 15 minutes needed to fill the questionnaire individually. During antenatal care, the result of hemoglobin level at 28 weeks was recorded. Women who had hemoglobin < 11 g/dL were given oral iron and maternal nutritional education.

As regards nutritional education, the available subjects at the day were educated in group at outpatient or inpatient level for about 30-45 minutes. The importance of well-balanced diet for the individual as a general & for the pregnant women in particular are assured & discussed. Sources of food items in general & iron specifically are presented & demonstrated. Examples for well balanced meals rich in iron are provided. Handouts were distributed to the subjects as a reference for them. All subjects included in the study were followed till their time of delivery. Observational check list were fulfilled at labor room or in post partum wards. The duration for data collection lasts 6 months precisely from October, 2010 to March, 2011.

2.9. Statistical Analysis
Collected data were coded and analyzed. Descriptive statistics for the variables were calculated. Variables were compared using chi-square test. All the analysis was performed using SPSS package version 19.0 and result was presented in tables, figures and charts

2.10. Significance of the results
* Test of significance was used to find out association between the
* Non significant difference obtained at $P > 0.05$
* Significant difference obtained at $P < 0.05$
* Highly significant difference obtained at $P < 0.01$

RESULTS

Table 1: the distribution of the study subjects according to their socio-demographic characteristics

Items	Frequency	Percent
Age /yrs		
20 - < 25	6	6.0
25 - < 30	76	76.0
30 - 35	18	18.0
Education		
Illiterate	6	6.0
Read and write	13	13.0
Basic	21	21.0
Secondary	31	31.0
University	29	29.0
Occupation		
House wife	83	83.0
worker	17	17.0
Consanguinity		
Present	48	48.0
Absent	52	52.0
Family type		
Nuclear	76	76.0
Extended	24	24.0
History of infertility		
Yes	11	11.0
No	89	89.0
Total	100	100.0

The general characteristics of the study subjects (Table 1) showed that, anaemia was found among more than three quarters (76%) of the subjects in the age group 25 to less than 30 years and about one third of them (31%) had secondary education, the majority of the study subjects (83%) were housewives. About 76% of

them lived in a nuclear family and 52% had no consanguinity.

Table 2: the distribution of the study subjects according to their past obstetrical history

Items	Results (n=100)
No. of pregnancy (mean ± SD)	3.8500± 2.79746
No. of abortion (mean ± SD)	1.3667± 0.66868
No. of deliveries(mean ± SD)	3.5300±2.57986
No. of live births(mean ± SD)	3.4000±2.48633
age of youngest child (in months) (mean ± SD)	33.2759±17.37188
Complication of previous pregnancy n (%)	
Present	43 (43.0)
Absent	57 (57.0)
Complication of previous delivery No (%)	
Present	25(25.0)
Absent	75(75.0)
Complication of previous post-partum No (%)	
Present	8(8.0)
Absent	92(92.0)
History of infertility No (%)	
Yes	11(11.0)
No	89(89.0)

Table (2), reveals that mean number of pregnancies was 3.85 (nearly 4), mean of number of abortion was 1.37(nearly 2), the mean number of births was 3.53(nearly 4), the mean number of living children was 3.4 (nearly 4), and the mean age of youngest child was 33.3 months. The majority (89%) of anemic pregnant women had no history of infertility. As regards complications in the pregnancy, previous births and postpartum complications it was present among, 43%, 25%, and 8% respectively of the subjects.

Table 3: Distribution of the study subjects according to their history of the current pregnancy

Items	Percent
Pregnancy: No (%)	
Planned	57(57.0 %)
Unplanned	43(43.0 %)
Antenatal follow up No (%)	
Regular	77(77.0 %)
Irregular	23(23.0 %)
Iron supplementation No (%)	
Regular	61(61.0 %)
Irregular	39(39.0 %)
Complications No (%)	
Anaemia and others	20(20.0 %)
anaemia	80(80.0 %)
Hemoglobin level at 28 weeks (mean ± SD)	Range 4- 10.5 g/dL SD (8.8650±1.03097)

Concerning history of current pregnancy, this table shows that, more than one half (57%, 61% respectively) of the anemic pregnant women, their current pregnancy were planned and they use iron supplementation regularly versus 43%, 39% respectively. Regarding antenatal booking and attendance, it was found that more than three quarters (77%) of the anemic pregnant women were following up the pregnancy regularly and 23% were irregular. The majority (80%) of subjects had anaemia only while 20 % had anaemia and other complications. As regard to the mean value of the hemoglobin (Hb) at 28 weeks of gestation anemic pregnant women was 8.8650±1.03097g/dl indicating anemic condition.

Table 4: Distribution of the study subjects according to their maternal and neonatal outcomes

Items	Value
Hemoglobin level at delivery (mean ± SD)	7.5-14.7mg/dL (10.5440±1.60544)
Gestational age (mean ± SD)	28-42 week 38.9400 ± 2.20569 weeks
Type of delivery No (%)	
Normal	76 (76.0)
CS	24(24.0)
Post –partum complications No (%)	
Present	3(3.0)
Absent	97(97.0)
Newborn No (%)	
Live	98(98.0)
Still birth	2(2.0)
Weight (mean ± SD)	1.120-4.100 (3.1424±543.8907)
Apgar scoring Range (mean ± SD)	
1st minute	2-9 (8.2500 ±1.40974)
5th minute	4-10 (9.6300 ± 0.98119)

As regards mean duration of current pregnancy it was 38.9(±2.20569) weeks the mean haemoglobin level (Hb%) at delivery was (10.5440 d/l ±1.60544). More than three quarters (76%) of anemic women were delivered their babies normally and 24%were delivered surgically, most (98%) of their newborns were living with the mean (±SD) values of the weight 3.1424 Kg (±543.8907). APGAR score at 1 min was 8.2500 (±1.40974) and at 5 min was 9.6300 (± 0.98119)

Table 5: Relation between perinatal outcomes and iron intake

Items	Regular intake n= 61	Irregular intake n= 39	P value
HB level at birth	0.079	10.7492	10.2231
Mod of delivery			
Normal delivery	30.0	46.0	0.504
C.S	9.0	15.0	
Newborn			
Birth weight	3042.3077	3206.3934	0.161

Gestational age	38.7179	39.0820	0.428
Apgar Score 1st min	8.4615	8.1148	0.232
Apgar Score 5th min	9.8718	9.4754	0.048*

This table shows that the surgical delivery was higher among subjects with irregular intake of iron supplements 9 15 versus 9 for those with regular intake). As regards APGAR score at 5th minute it was a statistically significant differences between the two groups with P value= 0.048

Table 6: Relation between hemoglobin level at delivery and mode of delivery

Items	n	%	Mean	P value
Normal delivery	76	76	10.88	0.001
C.S	24	24	9.50	

There was a highly significant difference between the subjects who delivered normal and those who delivered surgically. In relation to Hb % it was 10.88/dl among those with normal delivery versus 9.50/dl among those who delivered by CS.

DISCUSSION

The prevalence of anemia among Saudi female is result of low iron and vitamin C intake and the high consumption of beverages that contain polyphenols such as tea and coca which could inhibit the absorption of non-heme iron. Fortification of some foods such as salts and juices in combination with additional intakes of iron from supplements and some changes in dietary consumption patterns can eradicated iron deficiency. This can be done by increasing the nutritional education and awareness among population as well as by governmental acts that makes iron fortification of some foods mandatory (Al-Assaf, 2007). Anaemia was found in the present study among more than three quarters (76%) of pregnant women in the age group 25 to less than 30 years and the majority (80%) of them had anaemia at 28 weeks of gestation. This high prevalence of anaemia, may be partly attributed to haemodilution as most women were recruited during the second trimester, a period associated with plasma volume expansion (Idowu *et al.,* 2005). Another likely reason for the variation may be due to maternal depletion associated with multiparity and short inter-pregnancy intervals (King, 2003). Multiparous women with short inter-pregnancy intervals may not have had sufficient time to replace nutrients used during previous pregnancy and thus may enter another pregnancy with compromised nutrition. As evident in numbers of pregnancy and deliveries 3.8500± 2.79746 and 3.5300±2.57986 respectively. The higher prevalence of anaemia recorded among house wives (83%) and women with low education levels (71-40%), these points us to the role of nutritional education which plays in ensuring good nutrition and health. So, enlightened mothers are more likely to maintain good hygiene and be able to eat balanced diet that may ultimately lead to the reduction of risk factors associated with anaemia. Regarding antenatal booking and attendance, it was found that more than three quarters (77%) of the anemic pregnant women were following up the pregnancy regularly versus 23% were irregular. This study also highlighted the importance of antenatal booking and attendance in improving maternal health during pregnancy in corroboration with earlier study (Idowu *et al.,* 2005) as antenatal attendance of >10 times was found to be associated with reduction in anaemia prevalence. Early antenatal booking and regular attendance at antenatal clinic (ANC) ensures better monitoring and early detection of anaemia and the institution of appropriate corrective measures. According to the WHO, (2001b) a pregnant woman should pay at least 4-6antenatal visits to a health facility in order for the visits to be effective. As regard to the mean value of the hemoglobin (Hb) at 28 weeks of gestation anemic pregnant women was8.8650±1.03097 g /dl indicating anemic condition. The National Institute for Health and Clinical Excellence (NICE) advises that women should be offered screening for anaemia at booking and at 28 weeks' gestation (Anonymous, 2008). They define anaemia at booking as an Hb level <11.0 g/dL at booking; haemodilution will result in further drops during pregnancy and subsequent reduction in oxygen-carrying capacity. At 28 weeks the diagnostic level for anaemia is an Hb level of <10.5 g/dL. It was observed that 61 % of women take iron supplementation regularly compared to 39 % were irregular, this is supported by (Habib *et al.,* 2009), who stated that anaemia was significantly associated with non-compliance with iron supplementation as mentioned by Habib *et al.,* (2009) For pregnancy outcomes, 76% of anemic women were delivered their babies normally and 24% were delivered surgically, most (98%) of their fetal outcomes were living babies with the mean (±SD) values of the weight 3.1424±543.8907and This is not consistent with other studies that reported. The higher proportion of low-birth weight in anemic than non-anemic women (Scanlon *et al.,* 2000; Dreyfuss, 1998; Singh *et al.,* 1998). Although low birth weight had been reported by Steer, (2000)

and Singla *et al.*, (1997) in pregnant women due to poor plasma volume expansion. The only maternal outcome that was significantly ($p < 0.05$) associated with maternal anaemia, was APGAR score of at 1 min, this inconsistent with Lone *et al.*, (2004) who said that, newborns of anemic mothers had 1.8 times increased risk of having an APGAR score of <5 at 1 min As regard to maternal Hb % at delivery, it was observed that women who delivered normally were significantly more Hb % (10.88/dl) than those who delivered by CS (9.50/dl). This is not inconsistent with (Broek, 2003) who reported that the higher proportion of surgically delivered babies in anaemic than non-anaemic women may be partly attributed to maternal weakness to undergo proper spontaneous vaginal delivery due to anaemia. Also, anaemia is associated with reduced transportation of oxygen and nutrients which may be injurious to both the mother and the fetus. Regular intake of iron and nutritional education have no significant effect on the HB level at delivery, Mode of delivery, newborn weight, gestational age and apgar score at 1st minutes, the reason behind such observation could be due to either non compliance of the participants or other problems associated with absorption. It is important to note that some of the participants reported non compliance due to various observed side effects of iron tablets due to high dose. Heart burn, vomiting and constipation were among the most commonly reported side effects. One also should not exclude other factors including diets and healthy practices for pregnant women. A recommended strategy recommended by WHO to prevent iron deficiency anemia in pregnant women is to provide universal supplementation of iron (60 mg per day) and folic acid (400 µg/day) as soon as possible after gestation starts-no later than the third month-and continuing for the rest of pregnancy (Ugwuja *et al.*, 2010). Conclusion Iron intake, both from diet and supplements, during the third trimester of pregnancy was associated with higher Hb level at delivery and improve pregnancy outcomes. This study resulted in several recommendations:

1- Pregnant women should be counseled regarding the risks of adverse pregnancy outcomes with anaemia.
2- We recommended that routine iron supplementation should be given during pregnancy and postpartum to cover losses during delivery and lactation.
3- Obstetricians & Midwifes have an important role to play by making women aware of the iron content in a balanced diet, especially in green leafy vegetables.
4- Additional studies on pregnant women are needed evaluating immune function in response to iron supplementation.
5- Further study is needed to reconfirm this finding.
6- A structured health education program about anemia and its effects.
7- The adoption of a comprehensive national strategy for the prevention of anemia during pregnancy.
8- The incorporation of an anemia health education program in all MCHCs in the Kingdom of Saudi Arabia.

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