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A Study To Assess The Effectiveness Of Instructional Dietary Module On Influence Of Iron Absorption Factors On Haemoglobin Status In Pregnant Women In Selected Non Govt Maternity Hospital In Tirupati.

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ABSTRACT

INTRODUCTION : During pregnancy, the volume of blood in your body increases, so the amount of iron you need. Your body uses iron to make more blood to supply oxygen to your baby. If you don't have enough iron stores or get enough iron during pregnancy, you could develop iron deficiency anaemia. Iron can be found in two forms in foods heme and nonheme. Heme iron is only found in animal products, whereas non-heme iron is only found in plants.The recommended dietary allowance (RDA) is based on an average intake of iron 18 mg per day. However, individual requirements vary based on a person's gender and life stage. For instance, men and post-menopausal women generally require around 8 mg of iron per day. This amount increases to 18 mg per day for menstruating women and to 27 mg per day for pregnant women.

MATERIALS AND METHODS: This was a quasi-experimental study carried out with one group pre-test and post-test design were used. 80 antenatal pregnant mothers were selected through purposive sampling technique. as study subjects from a private and government hospitals. 24 hrs food recall method was adapted to know the iron absorption factors. In order to make aware of various foods which enhances iron absorption and certain foods inhibits the absorption, a dietary module developed. Dietary module distributed to experimental group samples before commencement of the 2nd trimester, about the module through education training given to experimental sample before they start. Once they convinced the investigator request them to commence the experiment on the day of 2nd trimester during their pregnancy. The investigator follows up the experiment through continuous monitoring till they reached to the delivery. Posttest collect the blood sample for biochemical analysis in 3rd trimester The initial and final analysis was done and compared with control group. data were analysed by descriptive and inferential statistics.

RESULTS: antenatal pregnant mothers age below 25 were 74 (61.7%) in experimental group .primary education 21 (26.2) % secondary education were 32 (40.0%) graduates were 27(33.8%) .Non-Anaemic pregnant woman were 2 (2.5 %) Anaemic Pregnant woman were 78 (97.5%) among mild to moderate were 39(48.8%)moderate to severe were 39 (48.8%) non-anaemic were 2(2.5%) in experimental group. antenatal pregnant mothers among mild to moderate were 19(47.5%)moderate to severe were 21 (52.5%) non-anaemic 0 % in control group. antenatal pregnant mothers among bio chemical analysis of 2nd

trimester pretest Hb status of mean +SD were 9.484+1.114 and standard error were 0.176.then the p value is 0.001(significant) then the posttest Hb status were mean+SD are 10.59+0.06 and standard error were 0.104 and the p value is 0.001(significant).

Introduction

During pregnancy, the volume of blood in your body increases, so the amount of iron you need. Your body uses iron to make more blood to supply oxygen to your baby. If you don't have enough iron stores or get enough iron during pregnancy, you could develop iron deficiency anaemia. Iron can be found in two forms in foods heme and non-heme. Heme iron is only found in animal products, whereas non-heme iron is only found in plants.The recommended dietary allowance (RDA) is based on an average intake of iron 18 mg per day.

However, individual requirements vary based on a person’s gender and life stage. For instance, men and post-menopausal women generally require around 8 mg of iron per day. This amount increases to 18 mg per day for menstruating women and to 27 mg per day for pregnant women.

Good nutrition can lead to a healthier and more comfortable pregnancy. It can give you more energy, reduce your risk of pregnancy complications such as anaemia, morning sickness, and constipation, and make you feel better in general. Proper nutrition is also excellent for your growing baby. It provides all the important nutrients your developing child needs. It reduces the risk for congenital abnormalities and improves your baby will be born at a healthy birth weight.

According to the World Health Organisation(WHO)it is estimated that more than 40% of pregnant women worldwide are anaemic. At least half of this anaemia burden is due to iron deficiency.

Pregnant women require additional iron and folic acid to meet their own nutritional needs as well as those of the developing foetus. Deficiencies in iron and folic acid during pregnancy negatively impacts the health of the mother, pregnancy, as well as foetal development.

guidelines for Iron Intake for Pregnant Women	**Iron Per Day (2nd and 3rdTrimesters)**	**Folic Acid Per Day**
World Health Organisation (WHO)	60mg	400mcg
Ministry of Health, Govt. of India	60mg	500mcg

Nutritional Enhancers and Inhibitors of Iron Absorption.

Nutritional Enhancers	Nutritional Inhibitors
Vitamin C	Phytates
Peptides from partially digested muscle tissue	Oxalates
Fermented food	Polyphenols: coffee and black tea
Organic acids: malate or citrate	Peptides from partially digested vegetable proteins
Meat	
Fish and Shellfish protein	Minerals: calcium

Need for the study Iron Needs during Pregnancy

The average iron cost of pregnancy in human varies between 480–1150 mg. In addition to the mother’s needs, 30–170 mg and 200–450 mg of iron are required for both placental and fetal needs, respectively . The maternal plasma volume and red blood cell (RBC) mass increase by 30 to 50% and 20 to 30% throughout pregnancy, respectively. At the same time, the RBC life span decreases slightly (9%) and erythropoietin levels increase (doubling by the end of the third trimester) . As a result, the mother’s iron needs increase throughout pregnancy.

Approximately 1 mg of daily iron intake is required during the first trimester of pregnancy .This is lower than for a non-pregnant woman because of the absence of menstruation. In the third trimester, physiological requirements vary between 3 to 7.5 mg/day, representing a mean increase of 4.1 mg/day above median pre-pregnancy needs. During the last trimester, the iron concentration in the body of the fetus is approximately 75 mg per kilogram , with most fetal iron being stored in RBCs (70%). Consequently, mothers are frequently proposed iron supplementation to prevent deficiency, particularly in iterative or multiple pregnancies.

Iron is an essential nutrient required for vital metabolic and cellular processes. Despite its importance, it is poorly understood how maternal and fetal iron homeostasis is regulated during pregnancy, including the contribution of the maternal, placental, and fetal signals during healthy pregnancy or in conditions ofiron deficiency and excess. Maternal iron insufficiency causes anaemia, which is a global health problem linked to adverse outcomes. Iron availability in maternal circulation is ensured by the physiological suppression of the hormone hepcidin.We showed that suppression of maternal hepcidin during pregnancy is essential for embryo health, as high maternal hepcidin activity induced by administering a hepcidin mimetic to pregnant mice caused severe iron restriction and anemia in dams and embryos, low birth weight, and embryo mortality. Using mouse models, we showed that during maternal iron deficiency, maternal hepcidin is further suppressed, but this is not sufficient to maintain plasma iron levels and embryo iron endowment.

Special Groups at Risk

Data from 1976–1980 NHANES II and 1982–1984 Hispanic HANES (HHANES) suggest that low socioeconomic status, low level of education, black or Hispanic background, and high parity were associated with iron deficiency (impaired iron status) in the MCV model for non-pregnant women (LSRO, 1984, 1989). It is reasonable to infer that the same factors would play a role, probably to a greater degree, when iron demands are drastically increased during the last half of pregnancy. The following factors are associated with an increased risk of iron deficiency:

- Pregnancy (second two trimesters)
- Menorrhagia (loss of more than 80 ml of blood per month)
- Diets low in both meat and ascorbic acid
- Multiple gestation
- Blood donation more than three times per year
- Chronic use of aspirin

Iron requirements during Pregnancy

During pregnancy, physiologic iron demands increase substantially to support feto placental development and maternal adaptation to pregnancy. **Table 1** summarizes iron economy during pregnancy [the estimates are based on a 120-lb (54-kg) woman]. Baseline maternal body iron losses during 9 mo have been estimated at 230 mg and would be higher were it not for the cessation of menstruation. The development of the placenta and fetus requires 360 mg Fe. An additional 450 mg Fe is needed to expand maternal red blood cell (RBC) mass during pregnancy. Thus, 1 g of iron must be acquired during pregnancy to preserve the maternal iron balance and support feto placental development. Some of that iron is recycled after pregnancy when the erythrocyte mass contracts to pre pregnancy concentrations with the exception of the iron that is lost through bleeding at delivery (150 mg). Therefore, the average net pregnancy-related loss of iron to the mother has been estimated to be 740 mg. However, iron requirements are not uniform throughout the 3 trimesters of pregnancy. In the first trimester, the requirements (estimated at 0.8 mg/d) are lower than before pregnancy because menstruation stops. As pregnancy advances, maternal RBC mass increases and placental and fetal growth accelerates, which result in the rise in physiologic iron requirements to 3.0–7.5 mg/d in the third trimester.

TABLE 1 Iron balance in pregnancy[1]

Iron fate	**Amount, mg**
Fetal iron	270
Placental iron	90
Baseline maternal body iron loss	230
Expansion of maternal RBC mass	450
Total iron needs during pregnancy	1040
RBC-mass contraction after delivery (450 mg) minus the blood lost at delivery (150 mg)	−300
Net pregnancy iron loss to the mother	740

presents a major challenge to systemic iron homeostasis. During pregnancy, physiologic iron demands increase substantially to support feto placental development and maternal adaptation to pregnancy. Baseline maternal body iron losses during 9 months are estimated at ~230 mg, and would be higher were it not for the cessation of menstruation. The development of the placenta and foetus requires ~ 360 mg of iron. An additional 450 mg of iron is needed to expand maternal red blood cell (RBC) mass during pregnancy. Thus, ~1 g of iron must be acquired during pregnancy to preserve the maternal iron balance and support feto-placental development. Some of that iron is recycled after pregnancy when erythrocyte mass contracts to pre-pregnancy concentrations except for the iron lost through bleeding at delivery (~150 mg). Therefore, the average net pregnancy-related loss of iron to the mother is estimated to be 740 mg. Iron requirements, however, are not uniform throughout the three trimesters of pregnancy. In the first trimester, the requirements

(estimated at ~0.8 mg/d) are lower than before pregnancy because menstruation stops. As pregnancy advances, maternal RBC mass increases and placental and fetal growth accelerates, resulting in the rise in physiologic iron requirements to 3.0 -7.5 mg/d in the third trimester. To meet the accelerating physiologic iron requirements, both dietary iron absorption and the mobilization of iron from stores need to increase. Many women enter pregnancy with insufficient iron stores to meet the needs of the pregnancy. In the United States, the prevalence of iron deficiency (ID) in women of child-bearing age has been reported to be 12% with a higher rate in Black and Hispanic women (19% and 22%, respectively) . Because ID and ID anemia (IDA) during pregnancy have been associated with adverse outcomes for the mother and the child, including increased risk of maternal mortality, premature birth, low birth weight, and neurodevelopmental impairment in infants , iron supplementation has been nearly universally recommended during pregnancy. Nevertheless, in the developed world, more women are iron replete than iron deficient when they become pregnant, thus prompting considerations of potential risks of indiscriminate iron supplementation.

STATEMENT OF THE PROBLEM:

A Study To Assess The Effectiveness Of Instructional Dietary Module On Influence Of Iron Absorption Factors On Haemoglobin Status In Pregnant Women In Selected Non Govt Maternity Hospital In Tirupati.

OBJECTIVES OF THE STUDY:

1. To assess the iron absorption factors which influence the haemoglobin status in the diet of pregnant women
2. To assess the effectiveness of instructional dietary module on foods which enhances iron absorption and its impact on iron and haemoglobin status in pregnant women.
3. To associate the pre -test and post-test of instructional dietary module on influence of iron absorption factors on haemoglobin status in pregnant women with their demographical variables.

RESEARCH HYPOTHESES:

H_1: There will be statistically significant difference between pre and post-test instructional dietary module of iron absorption, improvement of iron and haemoglobin status among anaemic pregnant women.

H_2: There will be statistically significant association pre and post-test of anthropometric, biochemical analysis and dietary iron intake pattern of pregnant women among selected demographical variables.

ASSUMPUTION

- Most of the pregnant women may have the low levels of haemoglobin .
- Dietary instructional module will have an impact on improving iron absorption and haemoglobin levels among pregnant women .

DELIMITATIONs: The Study is delimited to,

1. Antenatal Pregnant women who are attending antenatal OPD in local to Tirupati.
2. The Sample size of 120 antenatal mothers.

METHODOLOGY

3.1 RESEARCH APPROACH

An evaluative research approach is appropriate for the study.

3.2 RESEARCH DESIGN

Experimental design is appropriate for the study

3.3 SELECTION OF TOPIC

A Study To Assess The Effectiveness Of Instructional Dietary Module On Influence Of Iron Absorption Factors On Haemoglobin Status In Pregnant Women In Selected Non Govt Maternity Hospital In Tirupati.

3.4 RESEARCH AREA

In this research area was Non-Government maternity hospitals in Tirupati.

3.5 SAMPLE SELECTION

Second and third trimester of Anemic, non-anemic pregnant women and non-pregnant women

3.6 SAMPLE TECHNIQUE

puposive sampling technique

SAMPLE SIZE

Antenatal pregnant women in second and third trimester with anemic, non-anemic and nonpregnant women. The sample size was for this study is 120.

3.7 CRITERIA FOR SAMPLE SELECTION

The study sample is selected the following pre-determined criteria

❖ **Inclusion criteria**

- Antenatal Pregnant women who are attending antenatal OPD in local to Tirupati.
- Pregnant women who are able to speak Telugu and English.
- During pregnancy there is no medication changes as prescribed by the doctor.

❖ **Exclusion criteria**

- Avoiding pregnant women with complications
- Antenatal pregnant women who were not interested in intervention studies.

❖ **VARIABLES Independent variables**

Demographical information

Dependent variables

Anthropometric measurements for pregnant women and new born, dietary iron intake pattern, dietary supplementation of vitamin c, biochemical analysis, distribution of dietary module.

3.9 SELECTION OF TOOLS AND TECHNIQUE DESCRIPTION OF TOOLS

With help of a extensive reviews and various text books, journals, website and experts, the tool developed.

PART A GENERAL INFORMATION

Name, Age (Years), Education, Occupation, Type Of Family, Income, Gravidity Parity, Gestational Age.

PART B ANTHROPOMETRIC MEASUREMENTS

Height, weight, BMI, weight gain during pregnancy,

Height, weight of the new born

PART C

Dietary iron intake pattern in a whole day menu (24hrs Recall method) among antenatal pregnant women

DIETARY IRON INTAKE PATTERN IN WHOLE DAY MENU 24 HRS RECALL METHOD

S NO	MEAL TIME	FOOD ITEMS	FOOD QUANTITY	FOOD CATEGORY	TOTAL QUANTITY IN GRAMS

1. Type of diet – **Vegetarian / Non Vegetarian** 2. Type of staple cereal – **Rice/wheat/Bajra/Raggi/any other**

3. Cereal Intake - **High/ Low**
4. Phytates content in the whole day menu - **High/ Low**
5. Vitamin c content of whole day menu – **High/Low**
6. Vitamin A content of whole day menu – **High/low**
7. B - carotene content of whole day menu - **High /Low**
8. Folic acid content whole day menu – **High / Low**
9. B_{12}content of whole day menu – **High / low**
10. Tannins in the whole menu diet – **High /Low**
11. Acidic foods in the whole day menu – **Mild acidic/Moderate acidic/ severe acidic foods**
12. Dietary fiber content in whole day diet -**High / low**
13. Total Energy (kcal) in whole day menu - **High / low**
14. Total iron content in whole day menu- **High / low**
15. Total heme iron content intake diet - **High / low**
16. Total non- heme iron content in the diet - **High / low**
17. Iron density / 1000k.cal in whole day menu - **High / low**
18. Iron Supplemental capsules intake **– yes/No**
19. Any antacid tablets are using – **yes/ No**
20. Non- Heme iron contribution from in percentage

Cereals Provides –
Pulses Provides –
Green leafy vegetables provides –
Nuts & oil seeds provides - Dry Fruits provides – Vegetables provides –

PART D BIO-CHEMICAL ANALYSIS

Lab investigation were done to subjects**. (annexure IV)**

- Complete blood count (CBC)
- Hemoglobin (HB)
- Serum iron
- Trans ferritin saturation(Tfs)
- Erythrocyte protoporphyrin (EP)
- Total iron binding capacity(TIBC)
- Serum ferritin(STORAGE)

Bio chemical analysis among pregnant women beginning of 2^{nd} trimester,3^{rd} trimester, before delivery, for non-pregnant women initial reading and final readings and cord blood readings for newborn were done.

PART E DIETARY MODULE

- In order to make aware of various foods which enhances iron absorption and certain foods inhibits the absorption, a dietary module developed. Dietary module distributed to experimental group samples before commencement of the 2^{nd} trimester, about the module through education training given to experimental sample before they start. Once they convinced the investigator request them to commence the experiment on the day of 2^{nd} trimester during their pregnancy.

• The investigator follows up the experiment through continuous monitoring till they reached to the delivery. The initial and final analysis was done and compared with control group.

3.10 DATA ANALYSIS Data pool up

The collected data was pooled up according to the objectives of the study

** Statistical analysis**

The collected data were subjected to statistical analysis by using tools

- Cross tabulation
- Percentage of parameters
- Mean and standard deviation Anova for blood profile
- Comparison of means using t-test, other statistical tools for blood profile and supplementation
- Graphical representation of dietary module, supplementation, blood profile.

Result and interpretation Table 1

Age	Antenatal mothers				Total antenatal mothers
	Experimental		Control		
	f	%	f	%	f and %
below 25	53	66.2%	21	52.5%	74 61.7%
26& above	27	33.8%	19	47.5%	46 38.3%
Total	80	100.0%	40	100.0%	120 100.0%
Education					
Primary Education	21	26.2%	9	22.5%	30 25.0%
Secondary Education	32	40.0%	17	42.5%	19 40.8%
Graduate	27	33.8%	14	35.0%	41 34.2%
Total	80	100.0%	40	100.0%	120 100.0%
occupation					
Homemakers	14	17.5%	3	7.5%	17 14.2%
Self-employed/ Daily Wagers	18	22.5%	13	32.5%	31 25.8%
Govt. Employment	33	41.2%	15	37.5%	48 40.0%

Private Employment	15	18.8%	9	22.5%	24 20.0%
Total	80	100.0%	40	100.0%	120 100.0%
Type of family					
Nuclear Family	51	63.8%	18	45.0%	69 57.5%
Joint Family	29	36.2%	22	55.0%	51 42.5%
Total	80	100.0%	40	100.0%	120
					100.0%
Income					
30000 & less	44	55.0%	27	67.5%	71 59.2%
30001 & above	36	45.0%	13	32.5%	49 40.8%
Total	80	100.0%	40	100.0%	120 100.0%

The above table shows that antenatal pregnant mothers age below 25 were 74 (61.7%) in experimental group 21(52.5%) were control group and antenatal pregnant mothers above age 26 were 46(38.3%) in experimental group and the control group were 19 (47.5%). primary education 21 (26.2) % secondary education were 32 (40.0%) graduates were 27(33.8%) in experimental group. primary education were 09 (22.5%) secondary education were 17(42.5%) graduates were 14(35%) in control group. The Home makers were14 (17.5)% Self-employed/ Daily Wagers were18 (22.5%) Govt. Employment were 33(41.2%) Private Employment were 15(18.8%) in experimental group.

Antenatal mothers Home makers were 3(7.5)% Self-employed/ Daily Wagers were13(32.5%) Govt. Employment were 15(37.5%) Private Employment were 9 (22.5%) in control group. Among Nuclear Family were 51 (63.8) % Joint family were29 (36.2%) in experimental group. Antenatal mothers among in Nuclear Family were 18 (45.0%) joint family were 22 (55.0%) in control group. The above table shows that antenatal pregnant mothers income less then 30000 were44 (55.0%) above 30001 were 36 (45.0%) in experimental group. Antenatal mothers among in income less then 30000 were 27 (67.5%) above 30001 were 13(32.5%) in control group.

Table 2 Frequency and percentage distribution of gravidity among antenatal pregnant mothers

	Experimental		Control		Total
	f	%	f	%	
Primi	51	63.8%	26	65.0%	77 64.2%
Multi	29	36.2%	14	35.0%	43 35.8%
Total	80	100.0%	40	100.0%	120 100.0%

The above table shows that antenatal pregnant mothers in primi gravida were 51 (63.8 %) Multi gravida were 29 (36.2%) in experimental group. Antenatal mothers among in primi gravida were 26 (65.0%) Multi gravida were 14 (35.0%) in Control group.

Table 3 Frequency and percentage distribution of Haemoglobin status among antenatal pregnant mothers

	Experimental		Control		Total
	f	%	f	%	
Non-Anaemic PW	2	2.5%	2	5.0%	4 3.3%
Anaemic PW	78	97.5%	38	95.0%	116 96.7%
Total	80	100.0%	40	100.0%	120 100.0%

The above table shows that antenatal pregnant mothers in Non-Anaemic pregnant woman were 2 (2.5 %) Anaemic Pregnant woman were 78 (97.5%) in experimental group. Antenatal mothers among in Non-anaemic pregnant woman were 2 (5.0%) Anaemic Pregnant woman were 2 (95.0%) in Control group.

Table 4 Frequency and percentage distribution of Haemoglobin status among antenatal pregnant mothers.

stages of anaemia	Experimental		control		Total
	f	%	f	%	
Mild to moderate anaemia	39	48.8%	19	47.5%	58 48.3%
Moderate to severe anaemia	39	48.8%	21	52.5%	60 50.0%
Non anaemic pregnant	2	2.5%	0	0.0%	2 1.7%
Total	80	100.0%		100%	120 100.0%

The above table shows that antenatal pregnant mothers among mild to moderate were 39(48.8%)moderate to severe were 39 (48.8%) non-anaemic were 2(2.5%) in experimental group. antenatal pregnant mothers among mild to moderate were 19(47.5%)moderate to severe were 21 (52.5%) non-anaemic 0 % in control group.

Table 5 Association of SD and Standard error mean ,t value , p value of bio chemical analysis of pre test in second trimester and post-test in third trimester of Experimental group among antenatal pregnant mothers .

Bio chemical analysis	Standard deviation		Std. Error Mean		t Value	p Value
	Pre test	Post test	Pre test	Post test		
HB	1.11401	.6605	.17614	.1044	5.960	0.001**
RBC	.30449	.23821	.04814	.03767	28.806	0.001**

HCT	1.732	1.870	.274	.296	30.161	0.001**
MCV	2.975	1.920	.470	.304	12.263	0.001**
MCH	1.454	1.027	.230	.162	13.471	0.001**
Palates	4.494	3.262	.711	.516	10.030	0.001**
WBC	2.637	4.273	.417	.676	6.839	0.001**
Serum Iron	1.748	4.345	.276	.687	10.308	0.001**
Total Iron Binding. Cap.	27.538	41.793	4.354	6.608	9.959	0.001**
Total iron saturation	3.477	.736	.550	.116	1.118	0.001**
serum Pro.	18.121	24.402	2.865	3.858	8.659	0.001**
Ery.Pro.	10.693	7.987	1.691	1.263	12.057	0.001**

The above table shows that haemoglobin t value 5.960, p value at 0.001** significance, then serum iron t value is 10.30 it is significant 0.001**. Total iron binding capacity t value is 1.118 it is significant at 0.001**. Total iron saturation t value 1.118 and significant at 0.001**

Table 6 Association SD and Standard error mean ,t value , p value of bio chemical analysis of pre test in second trimester and post-test in third trimester of control group among antenatal pregnant mothers .

Bio chemical analysis	Standard deviation		Std. Error Mean		t Value	p Value
	Pre test	Post test	Pre test	Post test		
HB	.71554	.6131	.11314	.0969	6.957	0.341@
RBC	.36158	.25700	.05717	.04064	3.604	0.051@
HCT	3.094	3.196	.489	.505	3.333	0.002@
MCV	10.308	1.840	1.630	.291	0.526	0.602@
MCH	5.740	1.057	.908	.167	0.287	0.776@
Palates	9.060	2.960	1.433	.468	7.133	0.458@
WBC	3.396	2.908	.537	.460	0.786	0.436@

Serum Iron	2.213	1.789	.350	.505	1.952	0.0582@
Total Iron Binding. Cap.	31.576	22.624	4.993	3.577	3.576	0.456@
Total iron saturation	.594	.597	.094	.094	4.392	0.734@
serum Pro.	25.035	21.729	3.958	3.436	1.614	0.115@
Ery.Pro.	8.151	6.391	1.289	1.011	3.274	0.002@

The above table shows that haemoglobin t value 6.957 its is not significant. Then the serum iron t value 1.952, its not significant. Total iron binding capacity t value is 3.576 and not significant. Total iron saturation t value is 4.392 and its not significant.

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