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Biochemistry

THE EFFECT OF DECREASED HEMOGLOBIN LEVELS AT FIRST TRIMESTER ON MATERNAL AND FETAL OUTCOME – A RETROSPECTIVE STUDY

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ABSTRACT
Background And Objective: Iron deficiency anemia, especially during the first trimester has a more negative impact on both maternal & fetal well being. Commonly associated conditions are post partum haemorrhage, birth asphyxia, pre-eclampsia, low birth weight, preterm, abortions, still born and many more. Thus the study was aimed to determine the levels of haemoglobin in early pregnancy and effect of pregnancy outcomes at Primary Health Care, Ankalagi, Belagavi.
Methodology: A retrospective study was done from 2017 April to May 2020 April for a period of three years at PHC, Ankalagi, Belagavi. Over 718 pregnant women were enrolled. Regular ANC was done. Data was collected on Maternal Age, Body mass Index (BMI), Number of parity and Socio-economic determinants. Other Demographic characteristics included first trimester haemoglobin levels, gestational age at delivery & mode, birth weight, and pregnancy outcomes were recorded. Hemoglobin levels were estimated by Sahil's hemoglobinometer method. Categorised into four groups a) Normal :more than11g/L b) Mild anemia :9-10.9g/dl c) Moderate anemia (7-8.9g/dl) and d) Severe anemia (<7.0g/dl)
Results: Mean age was 18±39 yrs. Nearly 39.75% were anemic in early pregnancy. Mild anemic were 20.75%(149), moderate anemic were18.10%(130)and severe anemic were 0.4%(3)respectively. The pregnancy outcome of low level haemoglobins duing first trimester showed miscarriage/abortions of about18.79%, LSCS mode of delivery of about 17.02%, low birth weight of about 9.21%, preterm baby of about 2.12%, neonatal admissions of about 2.12%, still born of about 1.06%, and post partum haemorrhage of 1.77% respectively.
Conclusion: The above findings suggests that anemia in first trimester definitely has negative impact on both maternal &fetal health. Thus adequate iron intake in early trimester (prior to conception) is crucial for healthy pregnancy. It is one of the preventable causes which can decrease the maternal & fetal mortality. Should reinforce the health education from adolescent girls, with regular antenatal check up and active participation of ASHA workers. Mothers should receive appropriate nutritional advice and supplementation at their first point of contact with health care professionals.

KEYWORDS : Iron deficiency Anemia; First trimester; Body Mass Index; Low birth weight; Preterm.

INTRODUCTION

Erythrocytes are formed chiefly from the bone marrow and its production varies during the pregnancy period[1]. It is well known fact that haemoglobin levels during pregnancy tends to decrease from the first trimester then reaching minimum values at late second trimester and tend to increase in last trimester[2]. Thus according into ICMR, haemoglobin concentration were classified as anemic and non anemic in all the trimesters separately. Anemia during pregnancy is considered if the haemoglobin concentration lower than 11.6g/dl in first trimester, 9.7g/dl in second trimester and 9.5g/dl in third trimester[3,4]. Nearly 52 % were anemic in developing countries and 23% in developed countries[5] First trimester of pregnancy is crucial for developing the placenta where the nutrients exchange between the maternal and fetal, amniotic sac which provides the cushioning effect to the fetus, and neural tube (brain and spinal cord development)and many more. Due to the hemodilution phase and increased demands leads to nutritional deficiencies. One of the most common deficiency is Iron deficiency anemia[6]. During pregnancy integrally maternal need for supplementary iron average close to 800mg (elemental iron), of which about 300mg is for fetus and placental development and rest goes to for maternal haemoglobin mass expansion. Thus, iron required during pregnancy to perform its function is about 0.8mg per day in first trimester and 6-7 mg per day in the second half of pregnancy. Comprehensively, a pregnant woman needs average of 2-4.8 mg of iron per day[7].

Many studies have shown that iron deficiency anemia has a more bleak out on fetal growth than the anemia developing in later pregnacy[8,9]. Due to negative iron imbalance, there is increase risk for pre term labour, lowbirth weight babies, IUGR, as fetal complication[10,11].

Whereas perinatal infection, pre-eclampsia , more prone for abortions, LSCS mode of delivery and post partum haemorrhage were noticed as maternal complication[12-14]. Thus in this retrospective study, we aimed to find out the haemoglobin levels in first trimester and to know the effects of the low level o f haemoglobin on pregnancy outcomes.

METHODOLOGY

A retrospective study was done at Primary Health Centre (PHC), Ankalagi, Belgavi from April 2017 to May 2020 for a period of three years. Nearly 718 pregnant women were enrolled. Data was collected on Maternal Age, Pre-pregnancy weight, Height to calculate the Body Mass Index (BMI), Number of parity, BP &Socio-economic determinants which included- occupation, educational status, monthly income.

BMI categories:

Pre-pregnancy BMI was calculated as the body weight within 3 months prior to pregnancy in kilograms divided by height in meters squared(kg/m2); the participants were categorized as follows : BMI<18.5kg/m2 – under weight; BMI 18.5-24 kg/m2 -normal weight; BMI 24- 28 kg/m2 -over weight; BMI >28kg/m2-obese.

Haemoglobin Groups:

Further Anemia was classified according into WHO. Normal :more than 11g/dl of haemoglobin; Mild anemia (9-10.9g/dl), Moderate anemia (7-8.9g/dl) and Severe anemia (<7.0g/dl). Haemoglobin levels estimation: venous blood samples were drawn from medial cubital vein and stored in tubes containing EDTA to prevent coagulation and estimated by Sahil's haemoglobinometer. Simple tabulation and proportions were calculated.

The main perinatal outcomes were accepted as still birth, low birth weight, preterm labour, neonatal intensive care unit (NICU) admission, post partum haemorrhage, LSCS, abortions. These outcomes were obtained from the hospital records. Still birth was considered as death of fetus during pregnancy[15]. Low birth weight of baby was defined less than 2.5kg[16]. Preterm labour was defined the birth between 24-37 weeks of pregnancy[17,18]. Neonatal admissions were considered in following conditions like neonates with shorter than 32 weeks of gestation, transient problems, cardiorespiratory monitoring requirement or presence of Respiratory Distress Syndrome, severe jaundice, neonatal sepsis and conditions requiring

exchange transfusion were admitted to NICU. PPH was defined as having blood loss of more than 500ml after vaginal delivery or 1000ml after LSCS within 24 hours of delivery[19]. Spontaneous Abortions/ miscarriage is defined as explusion of the fetus before 20weeks of pregnancy[20].

RESULTS

A total of 718 pregnant women were enrolled in the study at the PHC Ankalagi, Belagavi. Mean maternal age was 18±39 years. Nearly 41.78% were in the age between 20-25 years &least with >35 years of 1.25%. Most were housewife which showed 91.78% & 58.07% had only primary education. 51.25% had monthly income of about 5000-10000 (Table No.1).

Table No.1 Sociodemographic Features Of The Study Participants From April 2017 To May 2020

Sociodemographic factors	Number(%)
1.Age (years)	
<20	217 (30.22%)
20-25	300 (41.78%)
26-30	163 (22.7%)
31-35	29 (4%)
>35	9 (1.25%)
2.Occupation	
Housewife	659 (91.78%)
Government employee	07 (0.97%)
Private employee	05 (0.69%)
Farmer	17 (2.36%)
Merchant	03 (0.41%)
Daily labourer	27 (3.76%)
3.Educational status	
Unable to read and write	136 (18.94%)
Read and write	78 (10.86%)
Primary education	417 (58.07%)
Secondary education and above education	87 (12.11%)
4.Monthly income	
<2000	56 (7.79%)
2,001-5,000	294 (40.94%)
5,000-10,000	368 (51.25%)

Nearly 33.84% were underweight during pregnancy & 5.01% were overweight (Table No.2).

Table No.2 Pre-pregnancy BMI Status

B.M.I	Total number (%)
Underweight	243 (33.84%)
Normal	430 (59.88%)
Overweight	36 (5.01%)
Obese	09 (1.25%)

Table No.3 Grades Of Anemia And Non Anemic Status In First Trimester Of Pregnancy

First trimester Haemoglobin levels	Number (%)
Mild anemia	149(20.75%)
Moderate anemia	130 (18.10%)
Severe anemia	02(0.27%)
Very severe anemia	01(0.13%)
Total anemic	282(39.27%)
Total non-anemic	436(60.72%)

Nearly 39.27% were anemic in first trimester. Majority were mild anemia (20.75%) and moderate anemia (18.10%) respectively.

Table No.4 Adverse Outcomes In Pregnancy In Anemic Patients During First Trimester.

Adverse pregnancy Outcomes	Number (%)
Low birth weight	26 (9.21%)
Preterm labour	6(2.12%)
Spontaneous miscarriage/abortions	53(18.79%)
LSCS mode of delivery	48(17.02%)
Neonatal admissions(NICU)	06(2.12%)
Still born	03(1.06%)
Post partum haemorrhage	05(1.77%)

DISCUSSION

Anemia is one of the frequent complications during pregnancy. Due to physiological changes in pregnancy affects haemoglobin and there is relative or absolute reduction in haemoglobin concentration. The most common cause is iron deficiency which contributes nearly 75% and folate deficiencies. Since during first trimester iron is required for the development of amniotic sac, placenta, neural tubes (i.e., brain & spinal cord). Low of haemoglobin leads to decreased oxygen capacity carrying in tissues, which has significant impact on both maternal & fetus like prematurity, post partum haemorrhage, spontaneous abortions, low birth weight and many more.

As socio-demographic data in our study showed majority of them had only primary education, most of them were housewife and monthly income was quite less. Socio-economic status is one the root cause for nutritional anemia i.e iron deficiency anemia. In longitudal observational study showed highest prevalence of anemia of about 98% in pregnant women in rural India done by Mishu Mangal[20] et al may due to patriarchial nature of society, discrimination against women, poverty, lack of knowledge, ignorance. According into NFHS -3 surveys, nearly 88% of women in Haryana, were vegetarians which could be one of the leading causes for iron deficiency anemia[21]. Based on Body Mass Index, underweight group of about 33.84%. Whereas in group of overweight & obese showed about only 5% & 1.25% respectively. Our study shows that underweight group of people are deficient in their nutritional needs.

Nearly 39.84 % were anemic in the first trimester of pregnancy. Most of them were mild (20.75%) and moderate type (18%). As a pregnancy outcomes under anemic group during first trimester showed, nearly 18.79% were had spontaneous miscarriage, followed by LSCS mode of delivery (17.02%). Our study showed, 9.21% of Low birth weights were associated during first trimester. Preterm labour and neonatal admissions showed 2.12% each. Nearly 1.77% had post partum haemorrhage and 1.06% had still born. In a large cohort study by Fatameh et al[23]., showed that anemia during the first trimester had neonatal moratilty and LSCS mode of delivery.

Oxygenation to tissues via haemoglobin which implies that it carries the nutrition to both maternal and fetal is crucial in all process of genesis during the pregnancy. Maternal anemia can have huge impact including infant mortality[24]. In many review literature showed significant relationship between maternal's anemia in the early of pregnancy with small for gestational and low birth weight[25-27]. On the other side, low birth weight increases the risk for neonatal mortality[28,29]. Birth weight is directly proportional to haemoglobin concentration. Nearly 0.14g/dl per gram increments in the birthweight of newborn[30].

In a contrast study showed during first trimester high haemoglobin levels group people had more preterm labour. Low level of haemoglobin group had more neonatal admissions (NICU), post partum haemorrhage and pregnancy induced hypertension. Thus addressing both low and high haemoglobin can be associated with complications[2]. Iron is crucial in neural metabolism and ramification, deficiency leads to abnormal in neurotransmitters and myelination process. Iron deficiency hinders the normal developmental mile stones including cognitive, socio-emotional and adaptive process in infant[31,32,33].

CONCLUSION

Our study shows low level of haemoglobin during early pregnancy (first trimester) have a negative impact on both maternal and fetal health. Thus iron supplements should be started prior to pregnancy phase (before conception) effectively. Mothers should seek advice from professional health care regarding the nutrition at their first point of contact.

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