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Original research article

A study to determine the association and impact of maternal anaemia on perinatal outcome in a tertiary care hospital

Dr. Kumari Mona[1], Dr. Pulak Raj[2], Dr. Tulika Singh[3]

[1]Tutor, Department of Community Medicine, Nalanda Medical College and Hospital, Patna, Bihar, India

[2]Senior Resident, Department of Pathology, AIIMS, Patna, Bihar, India.

[3]Tutor, Department of Community Medicine, Nalanda Medical College and Hospital, Patna, Bihar, India

Corresponding Author: Dr. Kumari Mona

Abstract

Aim: assessment of the maternal anemia and its impact on perinatal outcome in a tertiary care hospital.

Materials and methods: A prospective, observational study conducted in Department of community medicine, NMCH Patna, Bihar, India, for 1 year. A total of 200 consecutive clinically suspected cases of anaemia with singleton pregnancies at 34-40 weeks of gestation were included in the study. Their socio-demographic profile and hemoglobin levels were recorded. A descriptive analysis of the data was performed. **Results:** Out of the 200 clinically diagnosed cases of anaemia that were enrolled in the study 71.25% were from the rural background and 28.75% were from urban area. The mean age of the subjects was 23.3 years ± 3.4 SD. 78.5% of the antenatal mothers were in the age group of 20-30 years followed by 11% in the age group of above 30 years. Anaemia was reported in 70% of antenatal mothers while 30% had no anaemia. Out of these 70%, 51% had mild, 18% had moderate, and 1% had severe anaemia. The birth weight of baby less than 2.5 kgs was recorded in 102 patient with mild anaemia and 36 patient with moderate anaemia and 2 patient with severe anemia. The BMI ranged from 13.8 kg/m^2 to 24.3 kg/m^2 with the average BMI being 20.36kg/m^2. Out of the 200 antenatal mothers evaluated, 152 subjects (76%) had a normal BMI, 44 subjects (22%) were under-weight with a BMI of <17.2 kg/m^2 whereas only 4 of the subjects (2%) evaluated were overweight with a BMI of 25.9 kg/m^2.

Conclusion: Maternal anaemia in pregnancy is associated with illiteracy, low socioeconomic status, multiparity, inadequate antenatal care and rural geographic area. Severe anaemia was associated with high perinatal mortality.

Keywords: Haemoglobin, Maternal anaemia, Perinatal outcome, Severe anaemia

Introduction

Anaemia is the one of the most common medical disorder in pregnancy and has a varied prevalence, etiology and degree of severity in different populations being more common in developing countries.[1] World Health Organization definition for diagnosis of anaemia in pregnancy is a haemoglobin concentration of less than 11 g/dl (7.5 mmol/l) and a hematocrit of less than 0.33.[2] The World Health Organization uses the following haemoglobin cut offs to define anaemia in pregnant women. 9.0 to 10.9 g/l for mild anaemia, 7.0 to 8.9 g/l for moderate anaemia and lower than 7.0 g/l for severe anaemia. In India, more than 90% of anaemia cases are estimated to be due to iron deficiency because high iron requirement during pregnancy are not easily fulfilled by dietary intake especially when iron bio-

availability is poor.[3] Estimates from the World Health Organization report suggests that from 35% to 75% (56% on an average) of pregnant women in developing countries and 18% of women from industrialized countries are anaemic.[4] The prevalence of anaemia is high in central Asia and reported as 61-91% in India.[5,6] The estimated hemoglobin reduction from pre-pregnancy to mid-pregnancy is ~15 g/L.[7] For this reason, early pregnancy measures of hemoglobin may most accurately reflect the mother's pre-pregnancy hemoglobin levels. Assessment of period of gestation i.e. attitude, presentation of foetus, foetal heart sound were done in each antenatal visit, height of fundus and girth of abdomen in centimetres were measured from 20 and 30 weeks respectively, every fortnightly. Ultrasonographic obstetrical examination was done in the first trimester to confirm the gestational period and subsequently at 16, 24, 28, 32 and 36 weeks of gestation to measure the biparietal diameter, head and abdominal circumference and amount of liquor amni. Monitoring of foetal growth was done clinically by noting the maternal weight gain, height of uterus and girth of abdomen and ultrasonography. Decision regarding delivery was taken in between 36-38 weeks depending on certain jeopardy of fetoplacental unit with special consideration to pediatric attention and monitoring system during labor. The causes of IUGR are varied and may relate to placental insufficiency with the placenta unable to keep up with the growing demands of the fetus.[8] A possible mechanism suggested for IUGR in women with anaemia is that low hemoglobin levels restrict oxygen circulation in the body, thus creating an environment of oxidative stress or chronic hypoxia, which could then cause fetal growth restriction. Another reason, specific to iron deficiency anaemia pertains to an increased production of norepinephrine in iron deficient states, stimulating the production of corticotropin-releasing hormone. This in turn increases cortisol production which may possibly restrict fetal growth.[9] The aim of this study was assessment of maternal anaemia, and perinatal outcome in tertiary care hospital.

Material and Methods

This was a prospective, observational study conducted in Department of community medicine, Nmch Patna, Bihar, India, for 1 year.

Methodology

A total of 200 consecutive clinically suspected cases of anemia with singleton pregnancies at 34-40 weeks of gestation were included in the study. A detailed antenatal history, socio-demographic factors and obstetric history was obtained. The socio-economic status was calculated based on modified Kuppuswamy classification 2019. The BMI was calculated based on the standard weight and height recorded using a calibrated weighing scale. The hemoglobin levels were estimated by the cyanmethemoglobin method and recorded. The classification of anaemia was based on the WHO criteria; hemoglobin (Hb) concentration of <11 g/dl during pregnancy was considered as anemia and graded as mild, moderate, and severe anemia depending upon the Hb concentration in the range of 10–10.9, 7–9.9, and <7 g/dl respectively. The gestational age was determined on the basis of last menstrual period if patient was sure of her dates or by first trimester ultrasound if available. All the patients were followed up until delivery. After delivery, the birth weight, APGAR score after 5 minutes and any adverse perinatal outcome in terms of asphyxia, hypoglycaemia, perinatal death or admission & stay in NICU were noted. The data was collected, compiled, analysed and descriptive analysis performed.

Results

Table 1: Hemoglobin levels to diagnose anemia (WHO criteria)

So. No.	Pregnancy Status	Non Anemia (g/dl)	Anaemia g/dl		
			Mild	Moderate	Severe
1.	;nant women (16 to 45 years)	□11	10–10.9	7–9.9	< 7
2.	Non-pregnant women (16 years or above)	□12	11–11.9	8–10.9	< 8

Table 2: Demographic profile

Parameter	Number of patients	Percentage
Age Group		
Below 20 years	21	10.5 %
20-30	157	78.5
above 30	22	11
Family structure		
Joint	149	74.5
Nuclear	51	25.5
Alcoholic and Smoking Habits		
Alcoholic and Smoker	2	1%
Non alcoholic and non smoker	198	99%
Respondent Education		
up to 10^{th}	38	19%
above 10^{th}	162	81%
Working statues		
Non working	119	59.5%
Working	81	40.5%
Socioeconomic Class		
Upper middle	52	26%
Lower Middle	105	52.5%
Upper lower	43	21.5%

Table 3: Maternal Anaemia and residential status

Variable	Non-anaemic	Anaemia			Total
		Mild	Moderate	Severe	
Urban	21	27	21	0	69 (28.75%)
Rural	50	90	29	2	171 (71.25%)
Total	60	102	36	2	240 (100%)

Table 4: Association of maternal Anaemia and birth weight

Birth weight	Anaemia			No Anaemia 11g/dl or higher	Total (N, %)
	Mild 10-10.9 g/dl	Moderate 7–9.9 g/dl	Severe <7 gm/dl		
2.5Kgs	16	7	0	7	30 (15%)
2.5 Kgs	86	29	2	53	170(85%)
Total	102	36	2	60	200 (100%)

Results

Out of the total 200 participants in the study, 71.25% (n=171) were from the rural background and 28.75% (n=69) were from urban area. The mean age of the subjects was 23.3 years ± 3.4 SD. 78.5% of the antenatal mothers were in the age group of 20-30 years followed by 11% in the age group of above 30 years. The sociodemographic characteristics are shown in Table 2. Out of 200, 99% participants were non-smokers and non- alcoholics while 1% was smoker and alcoholic. Anaemia was reported in 70% of antenatal mothers while 30% had no anaemia. Out of these 70%, 51% had mild, 18% had moderate, and 1% had severe anaemia . The distribution of anemia in urban and rural area was as follows: mild anaemia 27 and, 90. 21 participants had moderate anaemia in urban and 29 in rural area as shown in Table 3. The birth weight of less than 2.5 kgs was recorded in 102 participants with mild anaemia and 36 respondents with moderate anaemia and 2 participant with severe anemia. The BMI ranged from 13.8 kg/m^2 to 24.3 kg/m^2 with the average BMI being 20.36kg/m^2. Out of the 200 antenatal mothers evaluated, 152 subjects (76%) had a normal BMI, 44 subjects (22%) were underweight with a BMI of <17.2 kg/m^2 whereas only 4 of the subjects (2%) evaluated were overweight with a BMI of 25.9 kg/m^2. The average height of the subjects was 153.44 cm ±4.21 SD and the average pre-pregnancy weight was 49.21kg ±5.26 SD. The mean birth weight was 1.92 kg. The minimum birth weight was 875 gm and the maximum birth weight was 3.326 kg. The association of birth weight in babies with the degree of anaemia is shown in table 4. Out of the 200, 170 babies with a birthweight <2.5 Kgs 85%, 86 had mild anaemia and 36 had moderate anaemia. 80 babies required admission to NICU with a duration of 2-10 days of which 41 (51.25%) were born to mothers with Hb less than 11g/dl. The reasons for NICU admission was mainly respiratory problem. The other causes included hypoglycemia, neonatal jaundice and meconium aspiration syndrome.

Discussion

Anaemia is a common problem in pregnant women in developing countries. The pregnancy outcomes shows variation depending upon the type of anaemia. Studies have demonstrated differences in outcomes in iron deficiency as compared to physiological anaemia of pregnancy. In populations where the rate of anaemia is low among non-pregnant women, the primary cause of anaemia during pregnancy is likely to be plasma volume expansion, and this type of anaemia is not associated with negative birth outcomes. Maternal haemoglobin values during pregnancy is associated with LBW and preterm birth in a U-shaped relationship with high rates of LBW at low and high concentrations of maternal haemoglobin. However, some of this association may result from using "lowest haemoglobin" rather than a haemoglobin value controlled for the stage of pregnancy. In our study, anaemia was classified according to the WHO criteria [10]. In our study 70% females were anaemic, (51% had mild, 18% had moderate, and 2% had severe anaemia) while 30% were not anaemic. In antenatal women from rural areas, anaemia was noted in 71.25 which corresponds to several studies done in rural Karnataka that report a prevalence of 64% in Kolar[11] and 72.5% in Belagavi.[12] However, in urban areas the burden of anaemia was 69.6% which was higher than the prevalence rate of 50.1% found in urban Udupi.[13] Several factors contribute to causation of anaemia during pregnancy; geographical location, dietary practice, access to medical services, pre-pregnancy haemoglobin levels and cultural practices. In our study, socio-demographic factors did not appear to be significantly associated with anemia although a younger age and a lower socio-economic status are known to be associated with anemia as revealed in other studies.

The effect of maternal anaemia on the foetus shows that with varying degree of anaemia the level of decompensation in the fetus also varies. Maternal haemoglobin below 8.0 g/dl.[14] is associated with significant fall in birth weight due to increase in prematurity rate and intrauterine growth retardation. Besides Hb level less than11.0 g/dl is associated with a

significant rise in perinatal mortality rate.[15] In our study the mean birth weight was 1.92 kg. The minimum birth weight was 875 gm and the maximum birth weight was 3.326 kg. Among 170 babies with a birthweight <2.5 Kgs (85%), 86 had mild anaemia and 36 had moderate anaemia. Some studies report that maternal anaemia diagnosed was associated with low dietary intake of iron, inadequate gestational weight gain, and twofold or greater increase in the risk of preterm delivery and LBW.[16,17] A few studies have looked into the effects of anaemia and neonatal outcomes. In a meta-analysis, maternal anemia determined in the first and second trimesters is significantly associated with preterm birth but not with low birthweight.[18] In yet another meta-analysis, which included just three studies no association between hemoglobin <10.0–11.0 g/l and IUGR was found.[19] The meta-analysis revealed that moderate to severe anemia (<9.0 or <8.0 g/L) was significantly associated with SGA, whereas there was no relationship with milder anemia. The associations reported in this meta-analysis are to be viewed with great care, as there is heterogenesity in methods and definitions.

Conclusion

Maternal anaemia in pregnancy is associated with low literacy rate, low socioeconomic status, multiparty, inadequate antenatal care and rural geographic area. Severe anaemia was associated with high perinatal mortality.

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