IMPACT OF MATERNAL ANEMIA ON PERINATAL OUTCOME

Rabiah Anwar, Kashif Razzaq, Nusrat Noor

Pakistan Navy Ship Shifa, Karachi Pakistan

ABSTRACT

Objective: To determine association between maternal anemia and poor perinatal outcome.
Study Design: Cohort study.
Place and Duration of Study: Department of Gynaecology and Obstetrics, PNS Shifa Karachi, from Apr 2017 to Sep 2017.
Material and Methods: A total of 643 women fulfilled the inclusion criteria. Of these, 342 women were anaemic (haemoglobin <11g/dl in labor and on two previous occasions in current pregnancy) and were labeled as group A. A total of 301 women had haemoglobin >11g/dl at all times during pregnancy and were labeled as non-anaemic group B. Perinatal outcomes included preterm delivery, low birth weight (LBW) at delivery, intrauterine growth restriction, APGAR score at 1 and 5 min, intrauterine fetal death (IUD) were calculated and compared among the two groups.
Results: There were 229 (66.9%) cases of preterm delivery in group A compared to 44 (14.66%) in group B. Low birth weight (LBW) was observed in 124 (36.2%) cases in anaemic group and in 44 (14.6%) cases in non-anemic group B. There were 5 (1.4%) cases of stillbirth in anemic group as compared to 2 (0.66%) in non anemic women. In group A, new born of 109 (31.8%) cases showed Appearance, Pulse, Grimace, Activity, Respiration (APGAR) score <5 at 1 minute compared to 14 (4.6%) cases in other group. Similarly, the score <7 at 5 minutes was observed in 70 (20.4%) deliveries in group A and 12 (3.98%) in group B.
Conclusion: Low maternal haemoglobin levels are associated with increased risk of preterm delivery, LBW babies, APGAR score <5 at 1 min and IUD.

Keywords: Anaemia, APGAR score, Preterm delivery, Stillbirth, Low birth weight.

INTRODUCTION

Anemia is one of the most common medical problem affecting pregnant women. Maternal anemia is a risk factor for poor pregnancy outcome. During pregnancy, physiological anaemia occurs due to expansion of plasma volume causing decline in haemoglobin. That's why The World Health Organization defines anemia in pregnant females as haemoglobin level of 11g/dl or less while normal limit was <12g/dl for anemia in non-pregnant women[1]. The most frequent type of anemia during pregnancy is iron deficiency anemia. According to an estimation, about 56 million pregnant women (41.8% of total) are affected with anemia, largely because of iron deficiency[1]. Mean corpuscular volume (MCV) increases in pregnancy so reduction in MCV usually seen in iron deficiency is not considered a reliable marker in pregnancy. For diagnosis of iron deficiency anemia bivariate criteria (checking of haemoglobin and serum ferritin level) is used[2].

Maternal anemia has great effect on fetal health. Hypoxia due to anemia is a key factor in development of placental blood vessels. Moreover, placental maturity is required for spontaneous induction of labor[3]. Iron deficiency anemia during pregnancy is a known risk factor for preterm birth, low birth weight and small for gestational age babies[4]. It is also responsible for increased perinatal morbidity and mortality due to increase in preterm birth and intrauterine growth restriction[5]. Fetal wellbeing score i.e. Appearance, pulse, grimace, activity, respiration (APGAR) score, is also significantly decreased during the first & 5th minute after delivery in newborns of anaemic ladies[6]. The extent to which

Correspondence: Dr Rabiah Anwar, Classified Gynecologist, PNS Shifa Karachi Pakistan (*Email: rabiahanwardr@gmail.com)*
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placental changes caused by maternal anemia affects fetal development, growth & pregnancy outcome is not clearly understood[7]. The objective of this study was to determine if anaemic mothers have more poor perinatal outcomes like preterm birth, low birth weight, poor APGAR score value & still birth than nonanaemic mothers. Preterm babies, babies with low birth weight and low APGAR score requires NICU admission. Neonatal intensive care requires the use of technologically advanced treatment methods which are expensive and are not feasible for our poor population. The rationale behind our study was to identify areas to which intervention should be focused on improving maternal care and perinatal outcomes thus reducing NICU load because of preterm and low birth weight babies and to add to our research on maternal anaemia & its perinatal effects.

MATERIAL AND METHODS

The study was conducted in department of gynae/obs PNS Shifa Karachi for the period of six months from April 2017 to September 2017. PNS Shifa Karachi is a referral institute and a tertiary care hospital catering for large number of army and civilian personnel. A total number of 3986 women were delivered during the study period. Six hundred and forty three pregnant ladies fulfilled the inclusion criteria. Patients were selected by non probability consecutive sampling. Out of which 342 were anaemic and 301 were nonanaemic. Participants were divided in to two groups, those having iron deficiency anemia were included in group A and those not having were included in group B. The anemic group was defined as having hemoglobin level below 11g/dl and serum ferritin level <12µg/l. The nonanemic group includedthose women whose haemoglobin was >11g/dl.

The ladies included were between 20 and 35 years of age, had gestational age of 28-42 weeks, singletone pregnancy, spontaneous vaginal delivery.

The ladies having multiple pregnancy, delivery by cesarean section, previous history of preterm delivery, obstetrical complications (polyhydromnios, oligohydromnios) or medical illness (such as DM, preeclampsia/eclampsia, endocrinopathies and haemoglobinopathies) except anaemia were excluded in order to control for confounding factors. As preterm delivery can recur in next pregnancy, a past history of preterm delivery per se can cause preterm delivery rather than anaemia. That's why the ladies with previous history of preterm delivery were also excluded.

Informed consent was taken from all participants.

Women were interviewed in urdu. On the day after delivery, the data were recorded on a predesigned questionnaire that recorded BMI, haemoglobin estimation at first antenatal visit, at 28-32 weeks (because maximum haemodilution at this gestational age and anemia develops at this time), at 33-37 weeks & in labor, iron supplementation intake or not, gestational age at delivery, perinatal outcome (live birth, still birth, intrauterine fetal death), intrauterine growth restriction. The weight of newborn & then APGAR score at 1 and 5 minutes were recorded. The exact gestational age of pregnant women was determined according to last menstrual cycle that had been confirmed with ultrasound diagnostic procedure.

Preterm delivery was defined as delivery before 37 completed weeks of gestation.

Low birth weight considered if baby weighed <2,500g at term at birth.

IUGR was defined as fetal growth (measured by ultrasound) less than 10th centile for that gestational age.

Still birth was birth of fetus with no sign of life.

Data was analyzed using statistical software SPSS version 13.0.

Descriptive statistics were used to calculate Mean ± SD for age.

Sociodemographic characteristics were independent variables.

Frequency and percentage were collected.

Stratifications was done with regard to age, parity, education, employment status and monthly income. Chi-square test was applied for the comparison among groups.

Results are expressed in frequency, relative risk (RR) and 95% confidence interval (CI).

Difference was considered significant at $p \leq 0.05$.

RESULTS

A total of 643 pregnant ladies fulfilled the inclusion criteria, 342 (53.18%) anaemic and 301 (46.81%) nonanaemic. Group A included all anemic ladies while non-anemic patients were labelled as group B. Mean age of patient was 25.8 ± 4.54, with maximum age 37 and minimum 20 years. Age among the 2 groups is shown in table-I. Demographics and socioeconomic characteristics are displayed in table-II.

Monthly income was also calculated as it is important in etiology of anaemia. Income was divided in 4 groups as <10,000 rupees per month, 10-15,000 rupees, between 15 and 20,000 rupees and >20,000 rupees per month. It was found that 93 (27.1%) cases in anaemic group and 54 (17.94%) had earnings less than 10,000 rupees. However, 46 (13.4%) in anaemic and 49 (16.27%) patients were in above 20,000 rupees per month group. Perinatal outomes in both the groups have been depicted in table-III.

There were 229 (66.9%) cases of preterm delivery in group A compared to 44 (14.66%) in group B. Low birth weight (LBW) was observed in 124 (36.2%) cases in anaemic group and in 44 (14.6%) cases in non-anemic group. There were 5 (1.4%) cases of stillbirth in anemic group as compared to 2 (0.66%) in non anemic women. In group A, new born of 109 (31.8%) cases showed Appearance, Pulse, Grimace, Activity, Respiration (APGAR) score <5 at 1 minute compared to 14 (4.6%) cases in the other group. Similarly, the score <7 at 5 minutes was observed in 70 (20.4%) deliveries in group A and 12(3.98%) in group B.

In group A, 41 (12%) cases of IUGR were observed whereas, 14 (5%) were in group B.

Table-I: Age of patient.

Group of Patient	Mean	N	Std. Deviation
anaemic patient	26.2485	342	4.72526
Non-anaemic patient	25.4252	301	4.30796
Total	25.8631	643	4.54982

Table-II: Demographics and socioeconomic characteristics of anemic and non-anemic groups.

Characteristics	Anemic group (n=342)		Non-anemic group (n=301)	
	Number	Percentage	Number	Percentage
Parity				
Para 1	116	34	160	53.2
Para 2-3	165	48	124	41.2
Para 4-5	61	18	17	5.6
Education Status				
Illiterate	196	57.3	180	59.8
Primary qualified	83	24.2	74	24.5
Matric pass	48	14	32	10.6
HSSC pass	15	4.4	15	4.9
Monthly Income				
<10,000 Rs	93	27.19	54	17.94
10,000-15,000 Rs	135	39.70	117	38.87
15,000-20,000 Rs	68	19.9	81	26.9
>20,000 Rs	46	13.5	49	16.27

DISCUSSION

Anemia is a common problem in pregnant ladies of developing countries. Its prevalence is very high in South Asia, such as India, Pakistan and Bangladesh[1]. Local studies show 69.9% prevalence in Pakistan and 46% in India[8,9]. In our study, we found 53.18% anemic pregnant ladies which is very high.

Demographic parameters are significant risk factors of anemia in pregnancy. A study in Bangladesh found high parity and illiteracy as contributing risk factors of anemia[10]. During pregnancy, anaemia is more common in ladies with high parity because in these ladies iron reserves are depleted due to recurrent pregnancies. Anaemia develops when increased iron needs could not be met during pregnancy in lady with poor iron reserves and inadequate dietary intake[11].

Anaemia is associated with suboptimal pregnancy outcomes such as low birth weight, IUGR and preterm birth. It causes deterioration of fetal growth due to lack of oxygen flow to placental tissue[12]. Neonatal birth weight is an important indicator of obstetric care & health status. LBW is a major problem in developing countries and determinant of childhood morbidity and infantile death. We found a high frequency (36.2%) of low birth weight babies in anaemic ladies. Risk of low birth weight in our study was 2.48. Many other studies in low and middle income countries show that anaemic mother´s newborn weighed less than nonanaemic mother[4,7,13-15]. According to a study in India, 58% of low birth weight newborn's mother were anaemic[9]. A local study in KPK Pakistan also shows higher incidence of low birth weight newborn in anaemic mother as compared to nonanaemic mother[16].

In our study, we observed 4.5 relative risk of preterm birth among anaemic mother. A local study conducted at civil hospital Karachi shows 2.63 times higher risk of preterm birth[17]. Similarly, another local study shows 4 times risk of preterm birth in anaemic lady[18]. Consistent with our study, other studies also show higher risk[15,17]. At the sametime, a few studies did not find significant effect of iron deficiency anaemia during pregnancy on preterm birth and small for gestational age newborn[19].

The complication of preterm labor & pregnancy related infections have causal relationship with each other. Maternal infection during pregnancy is well-known risk factor for preterm labour. The relationship of anaemia & infections may be due to adverse effect on immune function by altering the proliferation of T and B lympho-

Table-III: Perinatal outcomes in anaemic and nonanaemic pregnant ladies.

Variables		Anaemic group (N=342)	Non anaemic group (N=301)	RR	95% CI	*p*-value
Preterm birth	yes	229 (66.9%)	44 (14.6%)	4.5	3.4-6.0	<0.001
	no	113 (33%)	257 (85.37%)			
Low birth weight	yes	124 (36.3%)	44 (14.6%)	2.48	1.8-3.3%	<0.001
	no	218 (63.7%)	257 (85.3%)			
IUGR	yes	42 (12.2%)	13 (4.3%)	2.84	1.55-5.1	<0.001
	no	300 (87.7%)	288 (95.7%)			
Perinatal mortality	yes	47 (13.7%)	49 (16.3%)	0.84%	0.5-1.2	0.37
	no	295 (86.3%)	252 (83.7%)			
Stillbirth	yes	5 (1.5%)	2 (0.66%)	2.2	0.4-11.2	0.46
	no	337 (98.5%)	299 (99.3%)			
APGAR < 5 at 1 min.	yes	109 (31.9%)	14 (4.65%)	6.85	4.01-11.6	<0.001
	no	233 (68.1%)	287 (95.3%)			
APGAR < 7 at 5 min	yes	70 (20.5%)	12 (3.98%)	5.1	2.8-9.2	<0.001
	no	272 (79.5%)	289 (96.0%)			

cytes, reducing the bactericidal activity of phagocytes & neutrophils[20].

Main causes of perinatal mortality are prematurity, birth anoxia, still birth and intrauterine death. In our study, risk of still birth was 2.2 compared to 1.75 times in study done in civil hospital Karachi[17]. Whereas, another local study shows 2.5 times risk[18]. In India, 100% mothers of stillborn and intrauterine death were anaemic[9]. Our finding of higher risk of intrauterine death and overall perinatal mortality amongst anaemic mothers was slso demonstrated in many studies[8,15]. In one study conducted in England showed that compared with women with haemoglobin ≥11 g/l, the risk of stillbirth and perinatal death was five and three fold higher in women with moderate severe anaemia (haemoglobin <10 g/l) at first visit and 28 weeks, respectively[21]. Anemia was also one of important factors for perinatal mortality in a study conducted at Addis ababa[22].

Better APGAR score signifies the status of wellbeing of fetus. Higher maternal haemoglobin concentration was correlated with APGAR score >7 and with lower risk of birth asphyxia. Risk of poor APGAR score <5 at 1 minute and <7 at 5 min were observed in anaemic ladies in this study. This study shows 5.1 RR whereas a study conducted in Civil Hospital Karachi shows 1.6 RR of low APGAR in anaemic ladies[17]. Another local study shows 1.8 times Low APGAR score risk at birth in anaemic mothers[18].

This study has its limitations. It was conducted in tertiary care hospital which is not representative of the country. Since most women in Pakistan deliver at home, the burden of anaemia can be expected to be much higher outside the hospital setting. Likewise efforts were made to limit confounders with strong exclusion criteria but conditions such as malaria, nutritional deficiencies of folate & vit B12 as well as human immune deficiency virus can trigger anaemia.

CONCLUSION

In conclusion, maternal anaemia has increased risk of delivery of premature and LBW babies, IUD, low APGAR score at 1 minute & 5 minute. The improvement achieved in the developed world is largely due to more effective prevention, diagnosis and treatment of anaemia. Iron supplementation may improve lymphocyte stimulation thus decreased risk of antenatal, intrapartum and postpartum infection and preterm delivery. We therefore propose that routine iron supplementation should be given during pregnancy and postpartum to cover losses during delivery and lactation. Obstetricians play important role by making women aware of iron rich diet, especially, green leafy vegetables during their antenatal visits. Moreover, community health worker have to effectively emphasize the health, hygeine and dietary advice and disseminate effects of anemia.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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