TO DETERMINE THE ASSOCIATION OF MATERNAL ANEMIA WITH PERINATAL OUTCOME IN TERTIARY CARE HOSPITAL

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ABSTRACT

Objective: Determine the association of maternal anemia with perinatal outcome in tertiary care hospital.
Study Design: Prospective study.
Place and Duration of Study: Department of Gynecology and Obstetrics, Combined Military Hospital, Sialkot from Jan 2018 to Dec 2018
Methodology: A total of 844 pregnant women were enrolled during study period. Maternal anemia, was categorized keeping with WHO criteria based on hemoglobin levels: no anemia/normal (≥11 g/dl), mild (10–10.9 g/dl), moderate (≥7-9.9 g/dl) or severe (<7 g/dl). Perinatal outcome included were preterm delivery, low birth weight, intrauterine growth retardation, intrauterine deaths, low Apgar and perinatal complications leading to neonatal intensive care unit admissions.
Results: Out of 844 pregnant women studied, 558 (66.11%) were anemic (hemoglobin <11 g/dl), and 286 (33.89%) women had hemoglobin ≥11 g/dl and were labeled as non anemic. The risk of preterm delivery and low birth weight was 2.5 and 3 times higher among moderate to severely anemic women, newborns of these anemic mothers had 2.8 times increased risk of having an Apgar score of <5 at 1min and there was increased risk of intrauterine growth retardation for moderate to severely anemic mothers.
Conclusion: Maternal anemia is associated with increased risk of preterm delivery, low birth weight babies, low APGAR, intrauterine growth retardation and increased perinatal mortality.

Keywords: Anemia, Low birth weight, Pregnancy, Prematurity.

INTRODUCTION

According to World Health Organization (WHO), an estimated over 2 billion people, almost 30% population of world, are affected by anemia and almost 50% of pregnant women are suffering from varying degree of anemia[1]. Although anemia has been found in women of both high and middle income nations, but its more prevalent in low/middle-income countries[2].

Furthermore, if the population survey found anaemia prevalence of 5% or more, WHO consider it as a public health significance or problem, and it is a severe public health problem if the anemia prevalence is ≥40% in a population[3]. In developing countries, the causes of anaemia during pregnancy are multifactorial; it may be due to acute and chronic infections as malaria, tuberculosis and HIV, hookworm infestation, micronutrient deficiencies of iron, folate, and vitamins A and B12 and anaemia due to malnutrition[4]. However degree of anemia during pregnancy may vary due to geographical location, dietary practice, and season. Irrespective of the cause, anemia during pregnancy has been linked with high risks of adverse maternal and neonatal outcomes. A recent study found out higher risk of cesarean section deliveries and more need for blood transfusions in mothers with anemia and the same study, conducted in Israel, also observed that the neonates of these mothers had an increased risk of a low APGAR score[5]. Other adverse neonatal outcomes include preterm delivery[6], small-for-gestational-age babies[7], and higher maternal risk of postpartum hemorrhage (PPH), and preeclampsia[8]. Preterm, low birth weight and babies with low APGAR requires neonatal intensive care with the use of highly advanced treatment methods which are expen-

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sive and are not accessible by our major segments of population who belongto lower or lower middle income group. Hence our study was designed to analyze the association of maternal anemia with perinatal outcomes.

METHODOLOGY

In this prospective study, the association of maternal anemia with perinatal outcome was studied in Obstetrics and Gynaecology department of Combined Military Hospital Sialkot, from January 2018 to December 2018. The study was approved by the Research and ethical committee of the institute (certificate no. A/28/EC-/28/19 Dated 2nd Nov 2019) and informed consent was taken from all the participants.

Statistical analyses were performed using SPSS software (Statistical Package for the Social Sciences, version 20.0; SPSS Inc., Chicago, IL, USA). Categorical data were presented as frequencies and percentages. Continuous data were presented as mean and standard deviation (SD). A chi-square test was performed to analyze the correlation between categorical variables. A *p*-value of ≤0.05 was considered significant.

A total of 844 women were studied who fulfilled the inclusion criteria during the study period. Maternal anemia, was categorized on basis of hemoglobin levels as non-anemic (≥11 g/dl), mild (10-10.9 g/dl), moderate (≥7–9.9 g/dl) or severe (<7g/dl). The data was recorded on a pre-designed questionnaire. Hemoglobin estimation was routinely done at antenatal visits, and in labor, however hemoglobin estimation at the time of delivery was finally considered for data interpretation. Perinatal outcome included were preterm delivery, Low birth weight, Intra-uterine growth retardation, Apgar score at 1min, Intra-uterine death and other neonatal complications leading to neonatal intevsive care unit admission.

All pregnant women attending antenatal clinics and intended to deliver in this institution and consented to be included in the study with singleton pregnancy and having no chronic illness as renal disease, hypertension, diabetes mellitus, etc. were included in the study.

Those pregnant women who were irregular in antenatal visits or having multiple gestation were excluded from study. Those having chronic anemias as sickle cell disease, thalassemia, or any immunologic disorders and those having h/o preterm delivery, obstetrical complications, neonatal deaths in order to control confounding factors were also excluded from the study.

RESULTS

A total of 844 women who were included in our study, out of which 558 (66.11%) were anemic and 286 (33.89%) women had hemoglobin >11 g/dl and were labeled as non anemic. The prevalence of mild anemia among anemic mothers was 31.90% and 61.29% had moderate anemia, and only 6.81% were severely anemic (table-I).

Table-I: Distribution of non-anemic and anemic mothers.

Variable	Frequency (%)	Mean. Hb (g/dl)
Non anemic mothers	286 (33.89%)	11.7 ± 0.5
Anemic mothers	558 (66.11%)	
Mild	178 (31.90%)	10.4 ± 0.4
Moderate	342 (61.29%)	8.4 ± 1.2
Severe	38 (6.81%)	6.3 ± 0.6

The mean age of anemic women was 28.85 ± 5.12 years against 27.08 ± 4.75 years non-anemic women. The BMI of women in both groups was almost similar, i.e. 23.62 ± 3.65 among anemic women compared to 24.15 ± 3.79. The majority of women in both groups had attended school up to grade 10 or higher. Most of the women were house-wives in both groups. About 362 (64.87%) in the anemic group and 92 (32.17%) of non-anemic women lived in a joint family, i.e. within laws, siblings in addition to own husband and children. Household monthly income revealing socioeconomic status was also noted (table-II).

Table-III outlines the analysis of perinatal variables in the two groups, as found in literature the impact on perinatal outcome is statistically significant in moderate to severely anemic mothers therefore the neonatal outcome in moderate to severely anemic mothers were grouped

together and compared with non-anemic mothers for statistical analysis.

There were 2 (1.12%), 7 (1.84%) and 3 (1.05%) IUD's in mildly anemic, moderate to severely anemic and non-anemic mothers respectively.

There were 64 (35.96%), 158 (41.58%) and 87 (30.42%) neonatesof mildly anemic, moderate to severely anemic and non-anemic mothers respectively, who were sick and admitted in nursery. The commonest neonatal complication in moderate to severely anemic mothers was prematurity with respiratory distress syndrome. Whereas other neonatal complications noted in all the groups were birth asphyxia, neonatal jaundice, transient tachypnea of newborn, neonatal sepsis, and meconium aspiration syndrome.

There were 5, 18 and 10 neonatal deaths inmildly anemic, moderate to severely anemic and non-anemic mothers respectivelyand the overall perinatal mortality was 7 (3.93%), 25 (6.58%) and 13 (4.55%) in mildly anemic, moderate to severely anemic and non-anemic mothers respectively.

Table-II: Comparison of maternal variables of anemic and non-anemic groups.

Maternal Demographic Variables	Anemic group (n=558)	Non-anemic (n=286)	*p*-value
Mean Age (years)	28.85 ± 5.12	27.08 ± 4.95	-
Mean BMI	23.62 ± 3.65	24.15 ± 3.78	-
Maternal Parity; n (%)			
Primigravida	118 (21.15%)	142 (49.65%)	0.075
Multigravida-para 2-4	292 (52.33%)	78 (27.27%)	0.004
Para 5 or more	148 (26.52%)	66 (23.08%)	0.398
Education level; n (%)			
No schooling	154 (27.60%)	84 (29.37%)	0.743
Upto grade 10	318 (56.99%)	136 (47.55%)	0.149
Above grade 10	86 (15.41%)	66(23.08%)	0.298
Family structure; n (%)			
Joint family	362 (64.87%)	92 (32.17%)	<0.05
Nuclear family	196 (35.13%)	194 (67.83%)	0.07
Monthly income: Rs.			
Up to25000	312 (55.91%)	42 (14.68%)	<0.05
25001 to 50000	178 (31.90%)	124 (43.36%)	0.025
Above 50000	68 (12.19%)	120 (41.96%)	<0.05

Table-III: Frequency & percentages, statistical values of perinatal variables.

Neonatal variables	Mild anemia n=178	Moderate-Severe Anemia	Non-anemic n=286	Relative risk: RR	*p*- value
Preterm	36 (20.22%)	138(36.32%)	54 (18.88%)	2.5	0.0003
Low birth weight	42 (23.60%)	154(40.53%)	52 (18.18%)	3.0	0.0008
IUGR	21 (11.80%)	66 (17.37%)	28 (9.79%)	2.3	0.0207
Low Apgar	26 (14.61%)	64 (16.84%)	34 (11.89%)	-	0.1510
IUD	2 (1.12%)	7 (1.84%)	3(1.05%)	-	0.617

DISCUSSION

Maternal anemia is a common problem encountered by gynecologists and obstetricians worldwide, especially in developing countries. Number of studies has found an association between anemia in pregnancy and adverse maternal and neonatal outcomes[9]. Neonatal adverse outcomes associated with maternal anemia include fetal anemia, stillbirth, low and very low birth weight babies, poor APGAR score, small for gestational age, birth asphyxia, and preterm delivery[10].

In this prospective study we examine the association between maternal anemia and a wide range of perinatal morbidity and mortality. Prevalence of anemia in our study was 66.11% which was closer to another study in PNS Shifa Hospital Karachi by Rabiah *et al*[11], noted the prevalence of anemia was 53.18%. However prevalence of anemia in another study in Hyderabad Bangladesh found high parity and illiteracy as contributing risk factors of anemia[14]. Similarly in our anemic cohort almost 78.85% pregnant women were multigravida and 27.6% were have no schooling. Anemia in pregnancy was commonly noted in women with high parity because of depleted iron reservesfor the reason thatof repeated pregnancies. Pregnancy increases the

Table IV: Breakup of admission in neonatal intensive care.

Neonatal Complications	Mildanemia n=64	Moderateto severe n=158	Non-anemic n=87	*p*-value
Prematurity/RDS	16 (25%)	48 (30.38%)	28 (32.18%)	0.02
Birth Asphyxia	12 (18.75%)	36 (22.78%)	14 (16.10%)	0.307
Hypoglycemia	8 (12.50%)	15 (09.49%)	10 (11.49%)	0.655
Neonatal Jaundice	8 (12.50%)	16 (10.13%)	12 (13.79%)	0.443
Neonatal sepsis	6 (9.37%)	18 (11.40%)	12 (13.79%)	0.628
Meconium Aspiration	3 (4.69%)	8 (05.06%)	3 (3.45%)	0.575
TransientTachypnea	10 (15.62%)	14 (08.86%)	8 (9.20%)	0.936

Table-V: Breakup of perinatal deaths in anemic and non-anemic groups.

Cause of perinatal death	Mild anemia n=7	Moderate to Severe (n=25)	Non-anemic n=13	*p*- value
Prematurity/RDS	3 (42.86%)	9 (36%)	6 (46.15%)	0.002
Neonatal Sepsis	1 (14.29%)	5 (20%)	2 (18.19%)	0.916
Birth Asphyxia	1 (14.29%)	1 (4%)	1 (9.09%)	0.564
Meconium aspiration	-	3 (12%)	1 ((9.09%)	0.818
Intra uterine death	2 (28.56%)	7 (28%)	3 (27.27%)	0.973

by Naila *et al*[12] was 90.5% which was quite higher than our study and that reported by other studies from Pakistan. The overall prevalenceof severe anemia in our study was 6.81% which is quite high comparative to the same study by Naila *et al*[12], who reported only 0.7% prevalence of severe anemia. This may reflect the underprivileged population, poor nutrition, insufficient antenatal visits and ineffective compliance to medications for the pregnant mothers in this community.

According to literature, a prevalence of anemia ≥40.0% is indicative of a severe public health problem[3]. Thus, our findings suggest that these deficiencies were a severe public health problem in Pakistani Women of Reproductive Age (WRA). Similar to our findings, previous surveys also found a high prevalence of anemia among Women of Reproductive Age[13].

Demographic parameters are significant risk factors of anemia in pregnancy. A study in plasma volume which further causes a reduction of hemoglobin level[15]. In this study, the results showed that, multigravida women were more likely to get anemia when compared to primigravida. In a study by Ali *et al*[16] in Tanzania found only 25.2% pregnant mothers were anemic with less than 2 parity whereas it was 48.5% in mothers with higher parity, furthermore it also agree in another previous study conducted by Khan *et al*[17] in Pakistan who found that multigravida were more likely to get anemia compared to primigravida women. Howeverthe findings of our study was in contrast with another study conducted by Chikwendu *et al*[18], in Nigeria who reports that primigravida were more likely to get anemia comparative to multigravida women. In our study incidence of preterm babies was 20.22% and 18.88% in mildly anemic and non-anemic mothers respectively whereas it was 36.32% in moderate to severely anemic mothers.

Similarly, another local study by Rabiah *et al*[11] shows higher risk of preterm birth in anemic mothers. Consistent with our study, another study by Mahamuda *et al*[19] from Bangladesh also show higher risk of prematurity in anemic mothers. Similar to our results another study by Tusimin *et al*[20] from Malaysia shows 13.1% in mild anemia and 19.7% in moderate to severely anemic mothers has the incidence of premature delivery. Our study shows incidence of low birth weight was 18.18%, 23.6% and 40.53% in non-anemic, mildly anemic and moderate to severely anemic mothers respectively, whereas in study by Tusimin *et al*[20] from Malaysia incidence of low birth weight was 12.1% and 18.6% in mild and moderate to severely anemic mothers respectively. Incidence of IUGR in our study was 9.79%, 11.80% and 17.37% in non-anemic, mildly anemic and moderate to severely anemic mothers respectively, whereas it was lower 2.4% and 3.3% by Tusimin *et al*[20] from Malaysia in mild and moderate to severely anemic mothers respectively.

Better Apgar score signifies the status of wellbeing of fetus. Higher maternal hemoglobin concentration was correlated with APGAR score >7 and with lower risk of birth asphyxia. In our study 16.84% neonates with poor APGAR score of <5 at 1 minute was observed in moderate to severely anemic mothers whereas it was in 11.89% neonates of non-anemic mothers. In a study by Bora *et al*[21] shows 1.8 times risk of Low APGAR score at birth in anemic comparative to non-anemic mothers.

Main causes of neonatal morbidity leading to admission in NICU in our study were prematurity with respiratory distress syndrome, birth asphyxia, neonatal sepsis and meconium aspiration syndrome. Perinatal mortality in our study was 4.55% in non-anemic mothers whereas it was 6.58% in moderate to severely anemic mothers. Whereas, another local study by Rabiah *et al*[11] shows 13.7% incidence of perinatal mortality in anemic mothers. Another regional study in India by Haider *et al*[22] observed 100% mothers of stillborn and intrauterine death were anemic. Our findings of higher risk of intrauterine death and perinatal mortality amongst anemic mothers was also demonstrated by Mahamuda *et al*[19] from Bangladesh. In a study conducted in England showed that compared with women with hemoglobin ≥11g/l, the risk of stillbirth and perinatal death was five and three fold higher in women with moderate to severe anemia (hemoglobin <10g/l) at first visit and 28 weeks, respectively[23].

CONCLUSION

Our study shows that anemia in pregnancy, mainly moderately severe anemia, is associated with perinatal morbidity and mortality, thereby pre-conception and during pregnancy treatment of women of reproductive age is likely to improve outcomes for affected women and their fetuses and neonates and can also decrease the illnesses and ultimate cost in resources constraint countries.

CONFLICT OF INTEREST

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

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