Effects of Maternal Anemia on Neonatal Outcome

Adhikari J[1], Belbase M[2], Rijal S[3]

ABSTRACT

Introduction: Anemia is one of the most prevalent nutritional deficiency problem affecting pregnant women. It is defined by World Health Organization as hemoglobin (Hb) level of less than 11 g/dl. Hemoglobin level of 9.0- 10.9 g/dl is mild, 7.0-8.9 g/dl is moderate and less than 7 g/dl is severe anemia respectively. Maternal anemia in pregnancy is commonly considered as a risk factor for poor pregnancy outcome and can result in complications that threaten the life of both mother and fetus. **Aims:** To find out neonatal outcome delivered to anemic mothers. **Methods:** A prospective case control study was carried out among 75 newborns delivered to pregnant women with hemoglobin below 10.9g/dL. Another 75 newborns were taken delivered at the same time, matched age and sex wise as a control group to mothers whose hemoglobin was more than 11g/dL. **Results:** Out of total 75 cases 35(46.7%) mothers had mild, 32(42.6%) had moderate and 8(10.7%) had severe anemia respectively. Similarly, the risk of having preterm baby among anemia group was 4.42 times higher than that in control group (p 0.033). The risk of having low birth weight in anemia group was 3.9 times higher than that in control group (p 0.04). The mean of head circumference (HC) among the anemia group was 33.9cm $\pm$1.40 (Mean$\pm$SD) and among the control group was 34.4cm$\pm$1.24(Mean$\pm$SD) with a mean difference of 0.5cm (p 0.032). The mean of length among anemia group was 45.3cm$\pm$1.97 (Mean$\pm$ SD) and among the control group was 46.2cm$\pm$1.69 (Mean$\pm$ SD) with a mean difference of 0.9 cm (p 0.003). **Conclusion:** Maternal anemia in pregnancy is associated with increased risk of adverse neonatal outcome. Efforts must be made to reduce the prevalence of anemia especially during pregnancy to reduce neonatal morbidity and mortality.

Keywords: Anemia, Low birth weight, Neonates, Prematurity

Author:

1. Dr. Jyoti Adhikari
2. Dr. Mohan Belbase
3. Dr. Shikha Rijal

    [1]Department of Pediatrics, Nepalgunj Medical College and Teaching Hospital, Kohalpur, Banke

    [2]Department of Psychiatry, Nepalgunj Medical College and Teaching Hospital, Kohalpur, Banke

    [3]Department of Pediatrics

Address for Correspondence:

Dr. Jyoti Adhikari

Assistant Professor

Department of Pediatrics

Nepalgunj Medical College and Teaching Hospital

Kohalpur, Banke

Email: adhikarijyoti@yahoo.com

INTRODUCTION

Anemia is one of the most prevalent nutritional deficiency problem affecting pregnant women. It is defined by WHO as hemoglobin (Hb) levels of less than 11 g/dL.[1] Hemoglobin level of 9.0- 10.9 g/dL is mild, 7.0-8.9 g/dL is moderate and less than 7 g/dL is severe anemia respectively.[2] CDC recommends that hemoglobin in pregnant women should not be allowed to fall below 10.5gm/dl in second trimester, taking into account the physiological changes in pregnancy.[1]

The fall in hemoglobin concentration during pregnancy is due to combined effects of hemodilution and negative iron balance.[3] Anemia affects nearly half of all pregnant women in the world: 52% in developing countries compared with 23% in the developed world. In Asia, the prevalence of anemia was

estimated to be 44% in non-pregnant and 60% in pregnant women.[4] Maternal anemia in pregnancy is commonly considered as a risk factor for poor pregnancy outcome and can result in complications that threaten the life of both mother and fetus. Current knowledge indicates that anemia in pregnancy is a risk factor for preterm delivery, subsequent low birth weight (LBW) and possible inferior neonatal health.[5]

Anemia begins in childhood, worsens during adolescence in girls and gets aggravated during pregnancy. The majority of women in the developing countries start pregnancy with depleted body stores of these nutrients and this means that their extra requirement is even higher than usual.[6] Thus, by better understanding of the effects of maternal anemia on neonatal outcome we can decrease neonatal mortality and morbidity.

METHODS

A prospective case control study was carried out after obtaining ethical approval from IRC NGMC among 75 newborns in the department of pediatrics, delivered to pregnant women with Hb level below 10.9g/dL over the period of one year from March 2019 to February 2020. Another 75 newborns were taken delivered at the same time, matched age and sex wise as a control group to mothers whose Hb level was more than 11g/dL. All newborns whose mothers were willing to participate and delivered in NGMCTH were included in the study whereas those mothers not willing to participate, delivered outside NGMCTH and pregnant women having chronic medical illness, twin pregnancy, previous history of preterm delivery were excluded from the study. Anemic and non-anemic mothers were matched by parity and babies delivered on the same day were taken. Every mother was interviewed personally in Nepalese language. Neonatal outcome were measured in terms of prematurity, birth weight, and anthropometric indices and compared between cases and control. Data taken was processed and analyzed by using Statistical Package for Social Sciences (SPSS 20). Variables were expressed in the form of frequencies and percentage. Descriptive studies such as mean, standard deviation, Odd Ratio were computed. Chi square test and t-test was done to analyze relationship between risk factors. The study was aimed to find out neonatal outcome delivered to anemic mothers.

RESULTS

Out of the total 75 cases 35(46.7%) mothers had mild anemia, 32(42.6%) had moderate anemia and 8(10.7%) had severe anemia.

Weeks of gestation	Case (%)	Control (%)	Total	OR(95% CI)	p value
<37	18 (24%)	5 (6%)	23		
>37	57 (76%)	70 (94%)	127	4.42 (1.46 10.43)	0.033
Total	75 (100%)	75 (100%)	150		

Table I: Preterm babies among case and control

There were 18(24%) preterm babies in anemia group in comparison to 5(6%) in control group. The risk of having preterm babies was 4.42 times higher in anemia group with a statistical significance (Table I)

Birth weight	Case (%)	Control (%)	Total	OR(95% CI)	p value
<2500Kg	19 (25%)	6 (8%)	25		
>2500Kg	56 (75%)	69 (92%)	125	3.9 (1.46-10.43)	0.04
Total	75 (100%)	75 (100%)	150		

Table II: Low Birth weight among case and control

Among 75 cases, 19(25%) were LBW in anemia group and 6(8%) were LBW in control group. The risk of having LBW was 3.9 times higher in anemia group than that in control group which is statistically significant (Table II)

	Mean HC (cm)	Std Deviation	p value
Case	33.9	1.404	
Control	34.4	1.246	0.032*

* t- test

Table III: Comparison of HC among cases and control

The mean HC in anemia group was 33.9 $\pm$1.40 (Mean$\pm$SD) cm whereas it was 34.4$\pm$1.24(M$\pm$SD) cm in the control group. The difference of the two means was statistically significant (Table III).

	Mean Length (cm)	Std Deviation	P value
Case	45.3	2.22	
Control	46.2	1.69	0.003*

* t- test

Table IV: Comparison of length among case and control

The mean length among anemia group was 45.3 $\pm$2.2 (Mean$\pm$SD) as compared to the control group 46.2$\pm$1.69 (Mean$\pm$SD). The difference of the two means was statistically significant (table IV).

DISCUSSION

In this study, majority of mothers had mild and moderate anemia 90 %(67) and severe anemia was seen in 10 %(8). Similar result was seen in a study conducted in India which documented 6.9% of anemic mothers had severe anemia.[7] Various studies have documented less than 5% anemic mothers had severe anaemia.[8,9] This could be because of poor nutritional status of adolescence girls, low socioeconomic status, inadequate ANC visits, malaria endemic region, intestinal parasitosis and increased prevalence of hemolytic anemia in the ethnic group

residing here. Among 75 cases 18(24%) were preterm and 5(6%) were preterm among control group. The risk of having a preterm baby in case group was 4.42 times higher than that in control group (p= 0.03). In cohort study conducted by Lone et al, the risk of preterm deliveries among anemic group was 4 times higher than that non anemic group which is similar to our study.[10] Another studies also showed similar results with risk of preterm deliveries.[11,12] All the above mentioned studies substantiate our study indicating that anemia has poor perinatal outcome with respect to prematurity which could be because maternal anemia induces a stress response and there is increased release of cortisol and other chemical mediators which increases the risk of preterm delivery.[13]

In this study 19(25%) newborns were LBW in the case and 6(8%) were LBW in the control group. The risk of LBW was 3.9 times higher in anemic mothers than in the control (p=0.04). Similar observations were reported in various studies.[14,15] Lone et al, in their study showed that the risk of low birth weight babies in the anemic group was 2.2 times higher than in the non-anemic group, which is slightly lower than that seen in our study.[10] The increased incidence of LBW in the present study could be due to low nutritional status, low income, illiteracy and poor antenatal care, as also mentioned by other studies.[16,17]

In our study the mean of HC among the case group was 33.9cm $\pm$1.40(M$\pm$SD) and among the control group was 34.4cm$\pm$1.24(M$\pm$SD) with a mean difference of 0.5cm (p value 0.032). The mean of length among the case was 45.3cm$\pm$1.97 (M$\pm$ SD) and among the control group was 46.2cm$\pm$1.69 (M$\pm$ SD) with a mean difference of 0.9 cm (p value 0.003) among the case and control group which is comparable to other studies.[8,18]

All the above mentioned studies substantiate our study indicating that anemia has poor preinatal outcome with respect to the anthropometric measurements which could be because the fetal hypothalamic-pituitary-adrenal axis is highly responsive to stress, which leads to increased release of glucocorticoid as a central adaptive mechanism. The glucocorticoid causes the catabolism of fat, glycogen and protein and chronically elevated glucocorticoid concentrations can lead to impaired tissue growth, impaired linear growth and muscle atrophy.[19]

LIMITATIONS

Small sample size, single center study, unable to randomize the samples is some of the limitations of this study.

CONCLUSION

The study shows effects of maternal anemia on neonatal outcome and compares the outcome with neonates born to non-anemic mothers during the study period. It was found that more than 2/3rd of pregnant mothers suffered from mild to moderate anemia and less had 1/3rd had severe anemia. The risk of having preterm and LBW was 4.4 and 3.9 times higher respectively in the case as compared to the control group. Similarly significant differences were observed in anthropometric measurements as well.

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