Effect of Maternal Anaemia on APGAR Score of Newborn

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Abstract

Background: To study the effect of maternal anaemia on APGAR score of newborn and to compare it with that of non-anaemic mothers.

Methods: In this cross sectional study 100 subjects were divided into two groups; each containing 50 subjects on the basis of consecutive non probability sampling . Group A included 50 anaemic pregnant women (haemoglobin < 11.0 g/dl) and group B 50 non-anaemic(haemoglobin >11.0 g/dl) pregnant women. In APGAR scoring five factors (which Apgar stands for) were used to calculate the baby's condition and each scored on a scale of 0 to 2, with 2 being the best score.A baby who scored 8 or above was considered in good health and a score of less than 8 was considered low. Data was compared using *t*-test at a confidence level of 95%. Frequencies were calculated for categorical data. These were compared using chi-square test, and *p*<0.05 was statistically significant.

Results: Difference between the two groups was found to be statistically very significant (p<0.003)in this variable also, as 16 out of 50 babies delivered to mothers in the anemic group showed a low APGAR at one minute as against 04 out of 50 in the babies delivered to the mothers in the non anemic group .Difference between the two groups was found to be statistically significant (p<0.012) . Twelve out of 50 babies delivered to mothers in the anemic group in our study showed a low APGAR at five minutes as against 03 out of 50 in the babies delivered to the mothers in the non anemic group.The number of anemic mothers who showed a low APGAR score of their infants were more at both one (32%) and five minutes (24%) as compared to the non anemic group (08% and 06% respectively), with a statistically highly significant difference of these two variables (p<0.003 and p<0.01 respectively) between the two groups.

Conclusion: There was a linear relationship of maternal anaemia in pregnancy with greater probability of low APGAR score at one and five minutes.

Key Words: Maternal Anaemia, Apgar score, Pregnancy.

Introduction

Anaemia is a common medical problem in pregnancy and maternal anaemia is commonly considered a risk factor for poor pregnancy outcome. Fetal morbidity and mortality is also increased by maternal anaemia by increasing the chances of preterm delivery and low birth weight of the babies. Infants are so compromised that they are born with low APGAR score at both 1 and 5 minutes after delivery. Though in some studies an association between maternal anaemia and lower infant Apgar scores was reported, but it is still unclear to what extent maternal anaemia affects maternal and neonatal health, as there is variation in the data from different studies. Anaemia is a state where the delivery of oxygen to the tissues is impaired because of a quantitative or qualitative deficiency of haemoglobin or red blood cells.[1] Anaemia is a widespread issue in pregnancy.[2] Anaemia is found in upto half of pregnant women in developing countries and almost 1/5th of the maternal deaths in pregnancy are either directly or indirectly related to anaemia. As per W.H.O Haemoglobin concentration of less than 11 gm/ dl and haematocrit of < 0-33 is declared as anaemia in pregnancy.[3,4]

Anaemia is a crucial health concern as it affects growth and development of neonates. Prevalence of anaemia in developing countries is upto 56%.[5,6] Anaemia not only results in maternal morbidity and mortality and affects the perinatal outcome, it can also cause maternal infections, post partum haemorrhage and pre-eclampsia. Body aches and easy fatigability are common symptoms in anaemic pregnant women. Some researches believe that the relationship of maternal mortality with anaemia is more because of haemorrhage and late admission instead of a prenatal anaemic condition. Fetal morbidity and mortality is also more common with maternal anaemia by

increasing the chances of preterm delivery and low birth weight of the babies. Infants are so compromised that they are born with low APGAR score at both 1 and 5 minutes after delivery.

Despite the advent of modern technology, the APGAR score which is the first test given to a baby just after birth in the delivery room remains the best tool for the identification of newly born infants in need of cardiopulmonary resuscitation. An association between maternal anemia and lower infant Apgar scores was reported in some studies. In 102 Indian women in the first stage of labor, higher maternal hemoglobin concentrations were correlated with better APGAR scores and with a lower risk of birth asphyxia.[7] When pregnant women were treated with iron or a placebo in Niger, APGAR scores were significantly higher in those infants whose mothers received iron.[8] There is variation in the data from different studies about the association of maternal anemia on adverse pregnancy outcomes and there is insufficient information to assess the overall adverse impact of anemia during pregnancy.

Patients and Methods

The study design was cross-sectional, comparing the effect of maternal anaemia on APGAR score of the baby with that of non-anaemic mothers. This study took place at Maternity Unit of Fauji Foundation Hospital, Rawalpindi during the year 2009. Sample size was 100 divided into two groups each containing 50 subjects. Group-A included 50 anaemic (haemoglobin <11.0 g/dl) pregnant women and Group-B 50 non-anaemic (haemoglobin >11.0 g/dl) pregnant women. Samples were collected by consecutive non-probability. Inclusion criteria was all pregnant women 16 years and older and a singleton pregnancy with a complete medical record. All women with a past history of preterm delivery, obstetrical complications or any medical illness, except anaemia, were excluded from the study for control of the confounding factors. Information was collected by direct interviewing method through questionnaire. Haemoglobin was estimated on automated haematology analyzer and APGAR score was calculated according to standard format (Table 1). In APGAR scoring five factors (which APGAR stands for) were used to calculate the baby's condition and each scored on a scale of 0 to 2, with 2 being the best score

A baby who scored 8 or above was considered in good health and a score of less than 8 was considered low.

Data was compared using *t*-test at a confidence level of 95%. Frequencies were calculated for categorical data. These were compared using chi-square test, and *p*<0.05 was statistically significant.

Table 1:Apgar Scoring:

	Sign	Score		
		2	1	0
A	Appearance (skin colour)	Normal over entire body	Normal except extremities	Cyanotic or pale all over
P	Pulse(heart rate)	>100 bpm	<100bpm	Absent
G	Grimace response(reflexes)	Sneezes, coughs, pulls away	Grimaces	No response
A	Activity (muscle tone)	Active	Arms and legs flexed	Absent
R	Respiration (breathing rate and effort)	Good, crying	Slow, irregular	Absent

Results

Difference between the two groups was found to be statistically very significant (p<0.003)in this variable also, as 16 out of 50 babies delivered to mothers in the anaemic group in our study showed a low APGAR at one minute as against 04 out of 50 in the babies delivered to the mothers in the non anemic group (Table 2).

Table 2: Comparison of the number of babies with low APGAR score at 1 minute of the mothers in the anaemic and non anaemic groups

Group	Yes	No
A, Anaemic (n=50)	16	34
B, Non Anaemic (n=50)	04	46
P-Value	0.003**	

**p = Significant

Table 3: Comparison of the number of babies with low APGAR score at 5 minutes of the mothers in the anaemic and non anaemic groups

Group	Yes	No
A, Anaemic (n=50)	12	38
B, Non Anaemic (n=50)	03	47
p-Value	0.012**	

**p = Significant

Difference between the two groups was found to be statistically significant (p<0.012) in our study as 12 out of 50 babies delivered to mothers in the anaemic group in our study showed a low APGAR at five minutes as

against 03 out of 50 in the babies delivered to the mothers in the non anaemic group (Table 3). The number of anaemic mothers who showed a low APGAR score of their infants were more at both one (32%) and five minutes (24%) as compared to the non anaemic group (08% and 06% respectively), with a statistically highly significant difference of these two variables (p<0.003 and p<0.01 respectively) between the two groups.

Discussion

Anaemia of pregnancy can have short-term and far-reaching sequelae for the newborn.[9] Although anemia is a common problem in pregnant women in developing countries, pregnancy outcomes vary depending upon the type of anaemia. Studies have demonstrated differences in outcomes between iron deficiency and physiological anaemia of pregnancy.[10] Also, the relationship between maternal anaemia and perinatal outcomes such as increased risk of perinatal death, preterm delivery, low birth weight and low APGAR score at 1 min is not clear.

In populations in which the rate of anaemia is low among non-pregnant women, the primary cause of anemia during pregnancy is likely to be plasma volume expansion, and this anaemia is not associated with negative birth outcomes.[11] Haemoglobin based assessments of prenatal iron status are also complicated by the physiologic anaemia of pregnancy. This drop in haemoglobin concentrations occurs routinely during pregnancy as a result of increased blood volume (plasma volume expansion) and does not indicate iron deficiency.[12]

Maternal haemoglobin values during pregnancy are associated with birth weight and preterm birth in a U-shaped relationship with high rates of babies who are small 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. A similar U-shaped association is likely to be present between maternal haemoglobin concentration and perinatal mortality, but the data to establish this association remain insufficient[13].Most of the 7.3 million perinatal deaths which occur annually in the world, are in developing countries especially Asia.[14]Presumably a large portion of these deaths could be prevented just by rectifying maternal anaemia.

The majority of newborns of the anaemic mothers group had an APGAR score of <5 at one minute in our study, with a highly significant difference from the non anemic group (p - 0.003). Our study results are consistent with the findings of Lone *et al*[15] who found that maternal anemia is associated with a 2.1 times increased risk (95% CI = 1.2-3.7) of APGAR score of <5 at one minute, in a univariate analysis of their study population. Our results were also consistent with a recent study which was conducted in El Sahel Teaching Hospital, Cairo, Egypt, in which subjects were divided into severely anemic, mildly anemic and non-anemic categories. In this study the comparisons between pregnancy outcomes in the three groups showed a statistically significant difference between gestational age, birth weight, birth length and Apgar score on one hand and the degree of anemia on the other hand.[16]

In a recent study though there was no statistically significant effect of anaemia on adverse pregnancy outcomes (small for gestational age, pre-term birth, mode of delivery, low birth weight, APGAR score < 7 at one and five minutes). But the adverse pregnancy outcomes were however more common in those with anaemia than in those without.[17]The high prevalence of iron and other micro-nutrient deficiencies among women before and during pregnancy calls for interventions such as periodic supplementation.[18] This may help to reduce manifestation of iron deficiency, improve public health and thus reduce maternal morbidity and mortality.

Conclusion

Their is a linear relationship between maternal anaemia in pregnancy with greater probability of low APGAR score at one and five minutes.

References

1. Grewal A. Anaemia and pregnancy: Anaesthetic implications. Indian J Anaesth. 2010; 54: 380–86.
2. Thangaleela T and Vijayalakshmi. Impact of anaemia in pregnancy. The Indian Journal of Nutrition and Dietetics1994a; 31:9251–56.
3. World Health Organization. Iron Deficiency anaemia. Assessment, Prevention, and Control. A guide for programme managers. 2001.
4. World Health Organization. Haemoglobin concentrations for the diagnosis of anaemia and assessment of severity. Vitamin and Mineral Nutrition Information System. 2011.
5. Badshah S, Mason L, McKelvie K, Payne R. Risk factors for low birthweight in the public-hospitals at Peshawar, NWFP-Pakistan. BMC Public Health 2008, 8:197-201
6. Harris ED. New insights into placental iron transport. Nutr Rev 1992; 50: 329-31
7. Rusia U, Madan N, Agarwal N, Sikka M, Sood S. Effect of maternal iron deficiency anemia on fetal outcome. Indian J Pathol Microbiol 1995; 38: 273-79.

8. Preziosi P, Prual A, Galan P, Daouda H, Hercberg S. Effect of iron supplementation on the iron status of pregnant women: Consequences for newborns. Am J Clin Nutr 1997; 66: 1178-82.

9. Chang S, Zeng L, Brouwer ID, Kok FJ, Yan H. Effect of iron deficiency anemia in pregnancy on child mental development in rural China. Pediatrics. 2013; 131: 755–63

10. Duthie SJ, King PA, To WK, Lopes A, Ma HK. A case controlled study of pregnancy complicated by severe maternal anemia. The Australian and New Zealand Journal of Obstetrics and Gynaecology 1991; 31: 125-27.

11. Whittaker PG, Macphail S, Lind T. Serial hematologic changes and pregnancy outcome. Obstetric and Gynecology 1996; 88: 33-39.

12. Brion MA, Leary SD, Smith GD, McArdle HJ, Ness AR. Maternal anemia, iron intake in pregnancy and offspring blood pressure in the Avon Longitudinal Study of Parents and Children. Am J Clin Nutr 2008; 88: 1126-33.

13. Verma KC, Dhar G. Relationship of maternal anemia, birth weight and perinatal mortality: a hospital study. Indian Pediatrician. 1976; 13: 439-41.

14. Shazia T, Faheem S, Saad R. Perinatal mortality: a survey. Pakistan Journal of Obstetrics and Gynecology 1994; 7(2): 1-8.

15. Lone FW, Qureshi RN, Emanual F. Maternal anemia and its impact on perinatal outcome in a tertiary care hospital in Pakistan. Tropical Medicine & International Health 2004; 4(9): 486-89.

16. Abdel-Raoufabdel-Aziz R, Ali DK, Talkhan HM. Pregnancy outcome and the effect of maternal nutritional status. J Egypt Soc Parasitol. 2013;43(1):125-32.

17. Masukume G, Khashan AS, Kenny LC, Baker PN, Nelson G, Scope Consortium. Risk Factors and Birth Outcomes of Anaemia in Early Pregnancy in a Nulliparous Cohort. PLoS One. 2015;10(4):e0122729.

18. Cutner A, Bead R, Harding J. Failed response to treat anemia in pregnancy: reasons and evaluation. Journal of Obstetrics and Gynecology 1999; 102: 523-27.