ORIGINAL ARTICLE

APGAR Score of Neonates Born to Anemic Mothers versus Non-Anemic Mothers

Tasleem Bano[1], Bushra Nazar[2], Muhammad Raza Tahir[3]

[1] Assistant Professor, Department of Pediatrics, Nawaz Sharif Medical College, Gujrat

[2] Women Medical Officer, Basic Health Unit Jheuranawali, Gujrat

[3] Medical Officer, Aziz Bhatti Shaheed Teaching Hospital Gujrat

A B S T R A C T

Objective: To determine the effect of maternal iron deficiency anemia on APGAR score of neonates at one minute.

Patients and Methods: This cross-sectional study was conducted at Aziz Bhatti Shaheed Teaching Hospital Gujrat from January 2017 to November 2017. In total 380 patients (50% anemic and 50% non-anemic mothers) were included in study. Grouping into anemic and non-anemic groups was done, based on their hemoglobin level, MCV, MCH and ferritin levels. APGAR score at 1 minute was noted in neonates born to both groups. Data was analyzed using SPSS 20.0. Chi square test was applied to evaluate the difference of APGAR score.

Results: Mean age in anemic was 27 ± 4.6 years and in non-anemic 26 ± 5.1 years. The mean hemoglobin among anemic was 8.9 ± 2.1 g/dl and among non-anemic 12.3 ± 1.2 g/dL. Mean MCV in non-anemic 85.7 ± 3.8 fl, while among anemic was 62.4 ± 4.1 fl Mean ferritin levels among anemic were 7.4 ± 1.1 ng/ml. Neonates delivered by anemic mothers had mean APGAR score of 6.5 ± 0.2 and those delivered to non-anemic had 8.7 ± 0.5. The APGAR score of neonates delivered by anemic and non-anemic showed a significant difference (p-value 0.00). The relative risk of having low APGAR score of infant in anemic compared to non-anemic mothers was 29.00 (95% CI, 13.1798-63.8098) with p<0.0001.

Conclusion: Maternal anemia is significantly associated with poor APGAR score in neonates.

Key words: Apgar score, Iron deficiency anemia, Maternal anemia

Introduction

Iron deficiency is a nutritional problem worldwide and considered as epidemic in many developing countries.[1] Iron absorption varies in male and female population depending upon their iron requirements. Males require 1mg/day of iron, menstruating females require 1.5mg/day while pregnant females require higher levels i.e. 4-5mg/day.[2] Almost 50% of iron deficiency anemia cases in pregnancy are due insufficient iron intake and reduced stores.[3] Hemoglobin below 11gms/dl in pregnant women is considered abnormally low and anemia develops due to iron deficiency.[4] The prevalence of iron deficiency anemia

in pregnant women in different countries varies. In USA the prevalence on anemia in pregnant women is 18.6%, which ranges from 6.9% in the first trimester of pregnancy to 29.5% in the third trimester.[5] Another study conducted among pregnant patients in Uganda showed prevalence of anemia to be 29.1%.[6] Another study conducted in southern Iran shows the prevalence to be 28.5%.[7] According to a survey the prevalence of iron deficiency anemia in India is 58.7% in pregnant women.[8] One of the study carried out in Pakistani population reported the prevalence of anemia in pregnant women to 90.5% [9]

while another study conducted in Swat District of KPK showed prevalence in first, second and third trimester to be 52%, 63.3% and 54% respectively.[10] APGAR score is a simple method proposed by Dr. Virginia Apgar[11] (Table 1). Despite the advancement in technology, the APGAR score remains the best tool for the identification of neonates in need of resuscitation. Maternal anemia is also considered a risk factor for poor perinatal outcome like low birth weight babies, low APGAR scores at one min, meconium stained liquor and NICU admissions.[12] Studies conducted in Nepal[13], India,[14] Pakistan[15] and Iran[16] showed a significant association of maternal anemia with low APGAR score while some other studies did not show any significant correlation.[17,18] The purpose of this study was to evaluate the association of maternal anemia with low APGAR score in neonates at 1 minute after birth.

Patients and Methods

This cross sectional study was conducted at Aziz Bhatti Shaheed Teaching Hospital Gujrat from January 2017 to November 2017 after approval of ethical committee of hospital. Sample size was calculated keeping the expected incidence among non-anemic to be 8.4% with 95% CI, 80% power of study and assuming relative risk of 3.? Total 380 females aged 15-45 years with singleton pregnancy either having iron deficiency anemia or non-anemic delivered at full term were included in study using purposive non-probability sampling. Anemic patients having multiple or twin pregnancy or preterm delivery and those having anemia due to hemoglobinopathies, thalassemia trait, red cell membrane defects, acute blood loss or anemia of chronic disease were excluded from study. After taking the informed consent, patients were equally divided in two groups, anemic group and non-anemic group having 190 patients each. Complete blood

count (CBC) and mean corpuscular volume (MCV) of both anemic and non-anemic group was noted. Serum ferritin levels and reticulocyte count was noted only in anemic group having low MCV. A hemoglobin of < 11 g/dl was considered as anemia and patients with low MCV were considered to have iron deficiency which was further confirmed by serum ferritin levels. APGAR score of all neonates, delivered by anemic and non-anemic females was calculated at one minute (Table 1). Score of ≤7 was considered abnormal while >7 was considered reassuring. Data was collected using a predesigned performa. Chi square test was applied to evaluate the difference in APGAR score of neonates born to anemic mothers compared to non-anemic mothers and relative risk was calculated. P-value <0.05 was considered statistically significant.

Results

Out of 380 patients, 190 were anemic and 190 were non-anemic. Mean age of both groups was almost same. Mean hemoglobin and MCV levels in anemic group were less as compared to non-anemic group. Mean ferritin levels among anemic were 7.4+1.1 ng/ml and mean reticulocyte count was 0.9+0.1%. Total 190 neonates were delivered by anemic females. They had mean APGAR score of 6.5+0.2 out of which 91.58% neonates had APGAR score of ≤ 7 while 8.42% had APGAR score of >7. The 190 neonates delivered to non-anemic females had a mean APGAR score of 8.7+0.5 out of which 96.84% neonates had APGAR score of >7 while 3.16% had score ≤7 (Table 2). The APGAR score of neonates delivered by anemic and non-anemic mothers showed a significant difference (Table 3). The relative risk of having low APGAR score of infant in anemic compared to non-anemic mothers was 29.00 (95% CI, 13.1798-63.8098).

Table 1: APGAR Scoring				
Sign		**Score**		
		2	**1**	**0**
A	Appearance (skin color)	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

Table 2: Characteristics of mothers and neonates participating in study (n=380)		
Variables	Anemic Mothers(n=190) Mean ± SD	Non-Anemic Mothers (n=190) Mean ± SD
Age (years)	27±4.6	26±5.1
Hemoglobin (g/dl)	8.9±2.1	12.3±1.2
Mean MCV (fl)	62.4±4.1	85.7±3.8
Ferritin (ng/ml)	7.4±1.1	-
APGAR Score of Neonates at 1 minute	6.5±0.2	8.7±0.5

Table 3: APGAR score of neonates delivered by anemic and non-anemic mothers (n=380)			
Group	APGAR Score		p-value
	≤7	>7	
Anemic (n=190)	174	16	0.000
Non-Anemic (n=190)	6	184	

Discussion

This study shows a significant difference in APGAR score of neonates delivered to anemic and non-anemic mothers. Many studies have revealed a similar picture of the problem presented above. Ghimire et al. conducted a study in Nepal and concluded that anemia is a significant risk factor for worse outcome in mothers and neonates.[13] In neonates it was significantly associated with low birth weight, low APGAR score, small for gestational age, intrauterine death and perinatal death. The study correlates with our results of APGAR score although they only enrolled mother with hemoglobin < 7g/dl as anemic compared to < 11 in our study and number of patients was less than our study group. Akhtar et al. in study conducted in Bangladesh showed that maternal anemia is directly associated with birth weight, placental weight and APGAR score of neonates.[20] Kaul et al. and Batar et al. demonstrated similar results in their studies conducted in Jummu city and New Delhi.[12,14] Similarly local studies conducted also showed a significant correlation of maternal anemia with low APGAR score of neonates. Lone et al. concluded that lower Apgar score risk at birth was 1.8 times among anaemic mothers.[21] Ahmed et al demonstrated a linear relationship between maternal anemia and low APGAR score at 1 and 5 minutes after birth.[15] Alizadeh et al. reported similar findings in his study conducted in Iran.[16]

Lelic et al conducted a study among Sideroblastic anemic mothers compared to controls and found out that there was no significant difference in APGAR score of neonates delivered to anemic mothers compared to controls which is contrary to our results.[17] However they had a small sample size compared to our study and included Sideroblastic anemic mothers compared to iron deficient anemic mothers in our study. Masukume et al concluded in their study that there is a significant correlation between maternal iron deficiency anemia and adverse pregnancy outcomes but not all outcomes including APGAR score of neonates.[18] They performed this study in a large multicenter nulliparous cohort. This is contrary to our results. They had a large sample size of 5690 patients with maternal anemia in only 2.2% of mothers.

The association of maternal anemia with poor APGAR score may be because of poor neonatal development in anemia, due to insufficient oxygen supply to fetus across the placenta as depicted in other studies.[22] This can be prevented by iron supplementation in pregnant mothers which may prevent the maternal and fetal adverse outcomes.[23] Our study has few limitations. It includes small number of patients, fetal and maternal outcome variables were not determined except APGAR score at 1 minute. Mortality and morbidity in neonates should also be compared. The effect of iron supplementation to anemic mothers should be determined. However, this study suggests that decreased neonatal wellbeing is associated with low hemoglobin levels in mothers, which is a major concern. Education of fertile women of childbearing age is very important in this regard. Moreover, antenatal booking and follow up should be encouraged through community services and media.

Conclusion

Maternal anemia is associated with significantly low APGAR score in neonates born to anemic mothers as compared to non-anemic mothers.

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marginalized areas of Gaza Strip, Palestine. Rev Bras Hematol Hemoter. 2014; 36(2):132-138.

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