Association Of Maternal Age And Hemoglobin Level With Apgar Score Of Newborns In A Tertiary Care Hospital Of Suburbs Of Islamabad

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Abstract

Objectives: To determine the association of Apgar score with maternal age and haemoglobin.

Methods: A cross-sectional study was conducted on mothers (n=306) delivering live, full-term, singleton babies by spontaneous vertex delivery. Women who suffered stillbirths had babies of unknown gestational age or showed co-morbidities were excluded. SPSS version 26 was used for data analysis. Mean $\pm$ standard deviation and percentages were calculated. Cross-tabulation and logistic regression were done to see the association between dependent and independent variables. A p-value of <0.05 was statistically significant.

Results: The ages of women ranged from 20 to 40 years (mean= 25$\pm$1.9). The number of patients aged 24 years with Hb <7g/dl was 6 (37.5%). Out of all, 90 (29.4%) patients had Hb >11g/dl, and their ages were 30 years which was significant (p = 0.000). Apgar score for the neonates showed that 258 (84.3%) had an Apgar score >7 while 48 (15.7%) had a score < 7. Babies of mothers whose age was 26 years had Apgar score < 7(25%) (p = 0.001). Neonatal birth weight, of <2kg was observed in infants born to young mothers of 26 years of age (20%) (p = 0.001), and a weight >3.5kg was recorded in 20 infants (6.5%). The younger mothers had lower Hb, and their babies had low Apgar scores <7 at the time of birth (p = 0.001).

Conclusion: Women of younger age and lower haemoglobin levels give birth to infants with low Apgar scores and birth weight. Low birth weight in neonates is significantly associated with a low five-minute Apgar score.

Keywords: Apgar score, Anemia, Birth weight.

1. Introduction

The Apgar scoring method provides extremely useful and established criteria for recording the condition of neonates. Apgar scoring is the most established criterion for neonates in clinical practice.[1] For neonate resuscitation, the Apgar score at one minute is used, while the score at 5 minutes, is reflective of the ability to recover and the possible requirement for continuing management.[2] In comparison with the 1-minute score, the 5-minute Apgar score is a far superior predictor of survival in newborns. In a study conducted recently, it was observed that neonates with an Apgar score of 10 at 5 minutes after birth, had a marked better survivability rate as compared to those whose score was below 5 (Apgar) with significantly fewer neonatal clinical ailments.[3]

An elevated risk of cerebral palsy was found in neonates with an Apgar score < 7 at 3 minutes. Uganda, 20-100 times more risk of cerebral palsy is found in them as compared to neonates having 7-10 Apgar scores at 5 minutes.[4] Apgar score of less than 7 at 5 minutes in a registry-typed indicated unfavorable nervous and age-related consequences, for instance, cerebral palsy, epilepsy, mental developmental delay, and reduced educational success.[4] A prior study performed in Zimbabwe confirmed that full-term singleton neonates having low Apgar scores at 5 minutes showed a mortality or morbidity rate of 42% .[5] Another study conducted in Uganda, showed that <7 Apgar score had unfavorable outcomes in 57 % of neonates. [6]

In the first 28 days of life, 4 million newborns die and about three-fourths of neonatal deaths take place in the first week after birth. A large proportion of these neonatal deaths take place in Southeast Asia and sub-Saharan Africa.[7] The health of a newborn is among the critical elements of the Sustainable Development Goal (SDG) to reach the goal of decreasing neonatal mortality to a low level of about 12 deaths per 1,000 live births by 2030.[8] The mean

age of 35 years is linked with better Apgar score and weight, as is indicated in many studies.[8] A higher death rate is observed in infants of younger aged mothers, [9] while mothers up to 35 years of age exhibited better neonatal weight and Apgar scores.[10] The requirement for iron is increased in late pregnancy, which is the specific time when the fetus grows[11]. An inappropriate iron supply due to anemia may lead to small gestational-age babies. Fetal morbidity and mortality are related to low birth weight and are also associated with growth and developmental anomalies. Serum low levels of Hb and ferritin are usually the causative factors that lead to low-birth-weight babies.[12]

 Since the Apgar score is a good indicator of neonatal survival, this study will be helpful in the determination of reasons accountable for a low 5-minute Apgar score, to take the initiative to plan for the reduction of neonatal mortality and morbidity. Besides this, the relation between maternal age and hemoglobin levels with Apgar scores will give us information regarding safer maternal age for conception.

2. Materials & Methods

Study design: A quantitative, cross-sectional study was conducted at Akbar Niazi Teaching Hospital, Bhara Kahu, Islamabad.

Study duration: The study was carried out from May 2022 to September 2022.

Study Population

Inclusion criteria: All mothers delivering live, full-term, singleton babies by spontaneous vertex delivery (SVD) during this period were included in the study.

Exclusion criteria: Women who suffered stillbirths, had babies of unknown gestational age, or showed co-morbidities were excluded.

Sample size calculation: The sample size (n = 306) was calculated using the Open Epi calculator with a confidence level of 95%, confidence limits of 5%, and population prevalence of 50%.

Data collection instrument and procedure

Data was collected with the help of proforma which covered all the required aspects of this research. This proforma was placed in labor rooms and all the parameters were filled by the doctor on duty. The purpose of the study and its procedure was explained to the participants. Written, informed consent was obtained

from all patients. Full confidentiality was maintained at all stages of the study by using strict coding measures. Participants were assured that disagreement and discontinuation from the study would not negatively affect the service to be provided. The ethical approval was taken from the IRB of Islamabad Medical and Dental College.

2.6. Operational definitions

Apgar score: The Apgar score consists of five components (heart rate, respiratory effort, muscle tone, reflex irritability, and colour), each given a value from 0 to 2. Thus, total scores range from 0 to 10, with higher scores indicating a better physical condition.

Low five-minute Apgar score: Apgar score<7 five minutes after delivery

Low neonatal birth weight: < 2.5 kg [11]

Maternal haemoglobin was categorized according to the WHO definitions of anaemia for pregnant women: severe (<7 g/dl), moderate (7 to <10 g/dl), mild (≥10–<11 g/dl), or normal (≥11 g/dl).[12]

2.7. Statistical Analysis

SPSS version 26 was used for data analysis. Results were presented in the form of tables and text using frequencies and summary statistics such as mean, standard deviation, and percentage to describe the study population. Cross-tabulation and logistic regression were done to see the association between dependent and independent variables. A 95% confidence level and a p-value of <0.05 were statistically significant.

3. Results

A total of 306 women were enrolled in our study, and their ages ranged from 20 to 40 years, with a mean age of 25 ± 1.9 years. On the measurement of their Hb levels, they were found to be in the range of 9-16 mg/dl, and the mean Hb was 12 ± 2.1 mg/dl. 16(5.2%) patients had low Hb (<7g/dl). The sociodemographic detail is given in Table 1.

 The number of patients aged 24 years and with Hb <7g/dl was 6 (37.5%). Out of all, 90 (29.4%) patients had Hb >11g/dl, and their age was 30 years which is highly significant (p = 0.000) as given in Fig 1.

When the Apgar score was calculated for the neonates, 258 (84.3%) had an Apgar score >7 while 48 (15.7%) had a score < 7. Babies of mothers whose age was 26 years had Apgar score < 7(25%) (p = 0.001).

On the recording of neonatal birth weight, infants weighing < 2kg were born to young mothers of 26 years of age (20%) (p = 0.001), and a weight of >3.5kg was measured in 20 infants (6.5%) born to out of 306 mothers. The females of the young age group had lower Hb levels, and their babies also had low Apgar scores <7 at the time of birth (p = 0.001). (Fig 2)

Table 1 Socio-demographic parameters of mothers who delivered at Akbar Niazi Teaching Hospital.

Parameters	Variables	Frequency (n = 306)	Percentage (%)
Residence	Urban	156	50.9
	Rural	150	49
Education Status	Illiterate	88	28.7
	Elementary	82	26.7
	Secondary	70	22.8
	College and above	66	21.5
Occupation	Housewife	169	55.2
	Private employee	75	24.5
	Government employee	62	20.2
Parity	Primi-para	123	40.1
	2-4	134	43.7
	5 or more	49	16

5. Discussion

The factors which are linked with the five-minute Apgar score are mandatory to define preventive measures. The overall proportion of low five-minute Apgar scores in Akbar Niazi Teaching Hospital was 18.1%. The score observed in our study was like a previous Ethiopian study in which 18.8% of neonates showed a low APGAR score when compared to neonates whose mothers had higher Hb levels.[13]

In a recent study by T Shah et.al, it has also been shown that babies born to mothers who were anaemic or even moderately anaemic their babies showed low APGAR scores as well as were low in weight and small for gestational age (SGA) babies.[11]

Another study was found consistent with our results in which Afifi et al suggested that different ranges of maternal Hb affect the weight, APGAR score and other anthropometric indices of newborns and mostly affect weight and APGAR score of newborns causing a decrease in them.[14]

Low Apgar scores were also found to be associated with higher rates of surgical deliveries which are also important predictors for low 5- minute Apgar scores[13] but in this study we excluded that factor of surgical deliveries and only took vaginal deliveries which shows that there is no solid relationship between surgically delivered babies and Apgar scores and birth weights also indicated by Badfar G et.al.[15]

Breech presentation at term has also been found to be associated with low one-minute Apgar scores.[16] A study conducted in Finland revealed that vaginal breech delivery was associated with low one and five-minute Apgar scores.[17]

In our study, we also noted that babies born to mothers of ages less than 26 years had lower birth weights than those born to older mothers. Similar data were obtained in the Tshwane district of South Africa which also recorded younger mothers giving birth to low-weight babies.[18] It has been observed that the age of mothers plays an important role in the gestational age of infants. Various studies conducted previously have shown that younger age mothers gave birth to babies who were of low weight and preterm.[19]

Low weight and Apgar scores of infants are found to be associated with not just young maternal age but also low iron levels in mothers. In Pakistan, mothers are usually anaemic, and some of the commonest reasons comprise a low socioeconomic status, heavy menstrual bleeding, younger age pregnancy, etc. [20,21]

Our results were in concurrence with these previous studies as we observed the mothers of younger age groups to be mostly anaemic, and their newborns had both low Apgar scores and birth weight. This can be attributed to improved maturity and responsibility on the part of mothers to look after their diet and health in a better way, especially while pregnant, to ensure a successful pregnancy and delivery.

Table 2 Patients of different age groups, their Hemoglobin levels in g/dl, and Apgar score of delivered babies at 5 minutes.

| Age years	Apgar score at 5 min		p-value	Haemoglobin (g/dl)				p value
	> 7 N (%)	<7 N (%)		<7 N (%)	7-9 N (%)	9-11 N (%)	>11 N (%)	
20	2(0.7)	0		0	0	0	2(0.7)	
21	6(2)	0		0	0	6(2)	0	
22	4(1.3)	4(1.3)		0	4(1.3)	0	4(1.3)	
23	10(3.3)	6(2)		2(0.7)	6(2)	8(2.6)	0	
24	16(5.2)	8(2.6)		6(2)	2(0.7)	6(2)	10(3.3)	
25	18(5.9)	0		0	6(2)	4(1.3)	8(2.6)	
26	16(5.2)	12(3.9)		0	16(5.2)	10(3.3)	2(0.7)	
27	20(6.5)	0	0.000	0	6(2)	8(2.6)	6(2)	0.000
28	42(13.7)	4(1.3)		2(0.7)	0	34(11.1)	10(3.3)	
29	26(8.5)	0		0	8(2.6)	12(3.9)	6(2)	
30	46(15)	4(1.3)		2(0.7)	4(1.3)	20(6.5)	24(7.8)	
31	12(3.9)	6(2)		0	0	14(4.6)	4(1.3)	
32	6(2)	0		0	2(0.7)	2(0.7)	2(0.7)	
33	4(1.3)	0		0	0	4(1.3)	0	
34	2(0.7)	2(0.7)		2(0.7)	0	2(0.7)	0	
35	12(3.9)	0		0	0	8(2.6)	4(1.3)	
36	6(2)	2(0.7)		0	2(0.7)	0	6(2)	
37	4(1.3)	0		0	0	4(1.3)	0	
38	2(0.7)	0		0	2(0.7)	0	0	
39	2(0.7)	0		0	0	0	2(0.7)	
40	2(0.7)	0		2(0.7)	0	0	0	
Total	258(84.3)	48(15.7)		16(5.2)	58(19)	142(46.4)	90(29.4)	
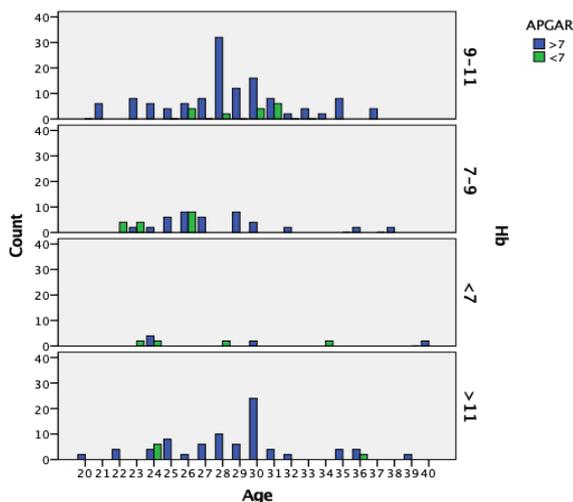
Fig-1 Pregnant females of different ages (years) with Haemoglobin level (g/dl) and APGAR score of babies at the time of delivery.
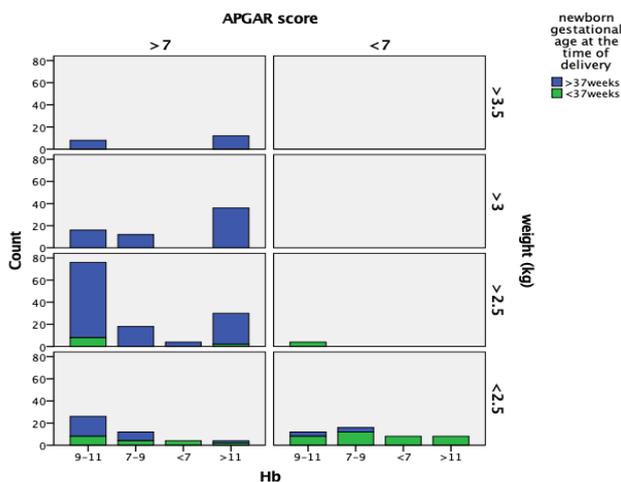

Fig-2 Relationship of pregnant patients with haemoglobin (g/dl), babies delivered at different gestational ages (weeks of pregnancy), the weight of the baby in Kg, and APGAR score (< 7 or>7).

5. Conclusion

From our study, we can conclude that women of younger age and with lower haemoglobin levels give birth to infants with low Apgar scores and birth weight. Low birth weight in neonates was also found to have a significant association with a low five-minute Apgar score. The most common cause of low hemoglobin in young women of Pakistan may be iron deficiency anemia as is evident from many studies conducted in Pakistan.

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