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Dr. Bushra Nasreen
Assistant Professor,
Department of Paediatrics,
VRK Womens Medical College, Teaching Hospital and Research Centre, Hyderabad, Telangana, India

Corresponding Author:
Dr. Bushra Nasreen
Assistant Professor,
Department of Paediatrics, ,
VRK Womens Medical College, Teaching Hospital and Research Centre, Hyderabad, Telangana, India

A study on effect of maternal anaemia on anthropometric profile and haemoglobin of newborns

Dr. Bushra Nasreen

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Abstract
Background & Objectives: Anaemia is one of the major health problems among antenatal mothers. Most of the anaemias seen in pregnancy are largely preventable and easily treatable if detected on time. According to WHO, Haemoglobin level below 11gm/dl at any time during pregnancy is considered as anaemia. If the mothers are anaemic, the foetuses are at a risk of preterm deliveries, low birth weight, morbidity and perinatal mortality due to impairment of oxygen delivery to placenta and foetus.
Methods: Data was collected from inborn neonates born to Anaemic and Non-anaemic mothers, selected by purposive sampling technique, within 48 hours of birth. Collected data was analysed using software SPSS v16.
Results: Among 1016 neonates studied,it was found that 23.6% of newborns born to mother's with hemoglobin < 11gm% had weight in the range 1300- 1500 grams as compared to 0.19% in the control group (haemoglobin>11gm%). Length of the babies born to anaemic mothers (<11gm%) was found to be lower than the babies born to non-anaemic mothers, 68.50% as compared to 49.4 % in controls .Head circumference of babies born to anaemic mothers (<11gm%) was found to be in the lower range,45.86% as compared to 9.25% in controls. Babies born to mother's with haemoglobin<11 gm%had cord hemoglobin in the range 14-15 gm/dl , 58.2 % as compared to 36.8 % in controls.
Interpretation & Conclusion: Comparison of all anthropometric parameters born to neonates of Mothers with Anaemia and no anaemia was statistically significant. It was also found that the cord blood haemoglobin done in neonates born to anaemic mothers was lesser than in neonates born to non-anaemic mothers.

Keywords: anthropometry, low birth weight, anaemia

1. Introduction
Anaemia is one of the major health problems among the antenatal mothers. Most of the anaemias seen in pregnancy are preventable and easily treatable if detected early. Decreased intake, faulty metabolism, health status of the mother, increased iron demand in multiple pregnancies, recurrent pregnancies within a short duration of time, increased blood loss during labour and infectious diseases are important causes which leads to anaemia during pregnancy [1, 2]
According to World Health Organization (WHO), Anaemia is defined as haemoglobin levels below 11gm/dl at any time during the course of pregnancy [3] and prevalence of anaemia is 56-60% in the developing countries [4]. If the mother is anaemic, the foetus is at a high risk of preterm deliveries, low birth weight, perinatal mortality and morbidity due to impairment of oxygen delivery to the placenta and foetus [5-8].
In our study, an attempt is made to correlate the anthropometric measurements like birth weight, length and head circumference of babies born to anaemic and non- anaemic mothers. This is also the first attempt to correlate haemoglobin levels (cord blood Hb) of neonates born to anaemic and non- anaemic mothers.

Aims and Objectives
1. To study the Anthropometric profile (birth weight, head circumference and length) of neonates born to anaemic mothers and non anaemic mothers.
2. To study the haemoglobin levels (cord blood Hb) of neonates born to anaemic mothers and non anaemic mothers.

Material and Methods

In our study, data was collected from the babies admitted at Dr VRK Womens Medical College & hospital, selected using purposive sampling technique. Permission was obtained from Institutional Ethical Committee.

Inclusion Criteria

Newborns born at Dr VRK Womens hospital during the study period- January 2017 to June 2018 were included in the study population. Neonates born to Anaemic and non anaemic mothers were taken into consideration.

Birth weight less than 2500gm was termed low birth weight according to WHO definition. Gestational age between 37 completed weeks to 42 completed weeks was taken as term, less than 37 completed weeks was taken as preterm. Birth weight between 10-90th percentile were taken as appropriate for gestational age, less than 10th percentile were taken as small for gestational age.

Exclusion Criteria

Neonates born to mothers with hemoglobinopathies, abruption placenta and major congenital abnormalities were excluded from the study

For each recruited baby, following measurements were taken by a single person.

Birth weight

1. Length at 24 hours
2. Head circumference at 24 hours

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Nude birth weight of the baby was recorded using electronic weighing scale to the nearest 5g. Length was measured using infantometer by resting the neonate in supine position. Head circumference is measured by positioning the tape just above the eyebrows (supraorbital ridges), above the ears, and occiput, so that the maximum circumference is measured.

All the circumferences were taken in centimeters, to one decimal place. To avoid interpersonal errors, all the measurements were taken by the investigator only.

Maternal haemoglobin value done at the admission in the labour room was collected from the case sheet and cord blood haemoglobin of the baby was sent immediately after birth.

Statistical Analysis

Collected data were analysed for determining the mean, standard deviation, sensitivity, specificity, critical limit, Analysis of variance, Pearson correlation coefficient, Regression Analysis of the anthropometric measurements at birth in relation to birth weight using the statistical software SPSS version 16.

Results

A Total of 1016 neonates admitted at Dr VRK Womens Medical College & Hospital Neonates born to anaemic and non anaemic mothers were taken into consideration

Comparison of Maternal Anaemia and Birth Weight Cases

Table 4: Mother's Hb and birth weight

		weight					Total
		1300- 1500	**1501- 2000**	**2001- 2500**	**2501- 3000**	**3001- 3500**	
	count	56	40	8	0	0	104
	8--8.9 %	53.80%	38.40%	7.69%	0.00%	0.00%	99.89%
Mother	count	42	15	98	20	0	175
HB	9--9.9 %	24.00%	8.57%	56.00%	11.42%	0.00%	99.90%
	Count	22	52	68	87	0	229
	10-10.9 %	9.60%	22.70%	29.69%	37.99%	0.00%	99.98%
	Count	120	107	174	107	0	508
Total	%	23.60%	21.06%	34.25%	21.06%	0.00%	99.97%

Table 5: Mother's Hb and birth weight

		weight					Total
		1300- 1500	**1501- 2000**	**2001- 2500**	**2501- 3000**	**3001- 3500**	
	Count	1	2	102	62	11	178
	11-11.9 %	0.56%	1.12%	57.30%	34.80%	6.17%	99.90%
Mother	Count	0	4	133	45	55	237
Hb	12-12.9 %	0.00%	1.68%	56.11%	18.90%	23.20%	99.80%
	Count	0	0	22	37	34	93
	13-14 %	0.00%	0.00%	23.60%	39.70%	36.50%	99.50%
	Count	1	6	257	144	100	508
Total	%	0.19%	1.18%	50.59%	28.30%	19.60%	99.80%

Among the cases, it was found that 23.6% of newborns born to mother's with hemoglobin <11gm% had weight in the range 1300-1500 grams as compared to 0.19% in the control group (haemoglobin>11gm%). Concluding that there is increased incidence of low birth weight in anemic mothers with a statistically significant p value (<0.001) Among the controls, it can also be observed that the weight of the babies increases with the increase in the mother 's hemoglobin levels.

II: Comparison Of Maternal Anaemia And Length of the Baby
Cases

Table 6: Mother's Hb and Length of the baby

			Length		Total
			42-44.5	45-50	
		count	100	4	104
	8--8.9	%	96.15%	3.84%	99.90%
Mother		count	122	53	175
HB	9--9.9	%	70.11%	29.90%	100.00%
		count	126	103	229
	10--10.9	%	55.02%	44.97%	99.90%
		count	348	160	508
Total		%	68.50%	31.49%	99.90%

Table 7: Mother's Hb and length of the baby

		length		Total
		42-44.5	45-50	
Mother Hb	Count 11-11.9 %	155 87.10%	23 12.90%	178 100.00%
	Count 12-12.9 %	78 32.9%	159 67.08%	237 99.9%
	Count 13-14 %	18 19.35%	75 80.6%	93 99.9%
Count Total % within Mother Hb		251 49.4%	257 50.5%	508 99.9%

It can be observed that 68.50 % of babies born to mothers with hemoglobin <11 gm% (8-9 gm%) had length in the range 42- 44.5 cm as compared to 49.4% in babies born to mothers >11gm% ,With a statistically significant p value (< 0.00).

III: Comparison Of Maternal Anaemia And Head Circumference Of The Baby
CASES

Table 10: Mother's Hb and Head circumference

		HC			Total
		29--30	31--32	33-35	
Mother HB	Count 8-8.9 %	102 98.07%	2 1.92%	0 0.00%	104 99.9%
	Count 9-9.9 %	69 39.42%	98 56.00%	8 4.57%	175 99.9%
	Count 10-10.9 %	62 27.07%	23 10.04%	144 62.88%	229 99.9%
Count Total %		233 45.86%	123 24.21%	152 29.92%	508 99.9.%

Table 11: Mother's Hb and head Circumference

		HC			Total
		29-30	31--32	33-35	
Mother Hb	Count 11-11.9 %	24 13.50%	86 48.30%	68 38.20%	178 100.00%
	Count 12-12.9 %	21 8.8%	77 32.4%	139 58.6%	237 99.80%
	Count 13-14 %	2 2.1%	38 40.8%	53 56.9%	93 99.8%
Count Total % within Mother Hb		47 9.25%	201 39.5%	260 51.18%	508 99.9%

It was found that 45.86% babies born to anemic mothers with hemoglobin less than 11 gm% had head circumference in the range 29- 30 cm as compared to 9.25% in babies born to mothers with haemoglobin>11gm% .concluding that head circumference was affected in mothers with had head circumference in the range 29- 30 cm as compared to 9.25% in babies born to mothers with haemoglobin>11gm% .concluding that head circumference was affected in mothers with lower haemoglobin levels.With a statistically significant p value (< 0.00).

IV. Comparison Of Maternal Anaemia With Cord Blood Haemoglobin

Cases

Table 13: Mother Hb and Cord Hb

		Cord HB			Total
		14-14.9	**15-15.9**	**16-17**	
Mother HB	Count 8-8.9 %	98 94.23%	4 3.84%	2 1.92%	104 99.9%
	Count 9-9.9 %	140 80.00%	34 19.42%	1 0.57%	175 99.9%
	Count 10-10.9 %	58 25.3%	120 52.40%	51 22.27%	229 99.9%
Count Total %		296 58.2%	158 31.1%	54 10.6%	508 99.9%

Table 14: Mother Hb and Cord Hb

		cord Hb			Total
		14-14.9	**15-15.9**	**16-17**	
Mother Hb	Count 11 –11.9 %	102 57.00%	64 37.00%	12 6.00%	178 100.00%
	Count 12 –12.9 %	79 33.3%	56 23.62%	102 43.03%	237 99.9%
	Count 13-14 %	6 6.45%	18 19.35%	69 74.19%	93 99.9%
Count Total % within Mother Hb		187 36.8%	138 27.16%	183 36.02%	508 99.9%

Among the cases, The percentage of babies with low cord blood levels in the range of 14-15 was 36.8 % in non anemic mothers, while the percentage of babies with anemic mothers having Hb <11 gm% was 58.2%. Cord blood hemoglobin levels was found to be lower in babies born to anaemic mothers with a significant p value (<0.000)

Discussion

Anaemia is one of the major health problems among the antenatal mothers. Most of the anaemias seen in pregnancy are preventable and easily treatable if detected early. If detected early, can prevent complications both for the mother and the neonate.

Factors

Maternal Anaemia and Birth Weight

In our study, it was found that 23.6% of newborns born to mother's with hemoglobin < 11gm% had weight in the range 1300-1500 grams as compared to 0.19% in the control group (haemoglobin>11gm%), proving lesser the mother's haemoglobin lower the birth weight.

Similar results were found in studies by Ekta dalal, Jeegar shah and Birakta Debbarma [9].

Maternal Anaemia and Length of The Baby

In our study, it was found that mother's with haemoglobin in the range 8-9 gm% had babies born with length lesser as compared to the babies born to mothers >11gm%, proving lesser the mother's hemoglobin lower the birth length.

Similar results were found in other studies done by Ekta Dalal, Jeegar Shah and Dr. Sangeetha [9, 10].

Maternal Anaemia and Head Circumference

In our study, it was found that 45.8% Babies born to anemic mothers with haemoglobin less than 11 gm% had head circumference in the range 29- 30 cm.concluding that lesser the mother's hemoglobin lower the head circumference. Similar results were found in other studies done by Ekta Dalal, Jeegar Shah and Dr. Sangeetha [9, 10].

Maternal Anaemia And Cord Haemoglobin

In our study it was found that the babies born to mother's with a hemoglobin level in the range of 8-9gm% had cord blood hemoglobin lesser than the normal value. Concluding that maternal hemoglobin affects cord blood hemoglobin.

In other studies – study conducted by Aarti Sareen et al in the year 2013 over a period of one year. A total of 246 pregnant women, 108 were anaemic with haemoglobin of less than 11g/dl and 138 had haemoglobin more than 11gm/dl (control group). It was concluded that among 108 cases, 21 mothers had babies with cord blood haemoglobin below 14g/dl (19.44%), difference being statistically significant (p value<0.01).

In converse, a study by Elgari et al. [11] showed that there is no significant difference in cord blood haemoglobin in babies born to anaemic and non- anaemic mothers.

Conclusion

Various factors influence the outcome of a neonate born to a anaemic mother. Knowledge of these factors which influence the outcome helps us in early detection of risk factors and appropriate action for a better outcome. Babies born to anaemic mother's had higher risk of having anaemia at birth, also being born as low birth weight babies and extremely premature. Early detection of maternal anaemia

along with appropriate management will result in successful outcome in the form of better anthropometric measurements of neonates and decreased chances of anaemia in the baby.

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