Original Article

Effect of Maternal Anemia on the Anthropometric Indices of Newborn

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ABSTRACT

OBJECTIVE: To study the effect of maternal anemia on the anthropometric indices of newborn.
METHODOLOGY: This cross-sectional comparative study was conducted from September 2018 to August 2019 at the Department of Physiology, University of Sindh in collaboration with Liaquat University Hospital Hyderabad. Four hundred pregnant females aged between 18 to 40 years, admitted to deliver a baby at Gynae and obstetrics department, LUMHS, Hyderabad/Jamshoro were selected by purposive random sampling, women aged below 18 and above 40, with multiple pregnancies, still births, threatened abortion having history of chronic disease, and with drug abuse were excluded from study. Females aged between 18-40 who were having singleton pregnancy were included in this study. After obtaining written consent, complete blood picture (CBC) was performed, in Diagnostic and Research Laboratory LUMHS, three parameters of anthropometry which include weight, length, and head circumference of the babies were measured.
RESULTS: The results were generated by using SPSS 21, for statistical data analysis. The prevalence of anemia was 206(51.5%). In anemic group 98(47.5%) babies born were low birth weight, and were less than 3rd percentile, and 15(7.2%) babies born were less than 3rd percentile length for age, the birthweight of babies in anemic mothers is 2.45kg±0.32 significantly (*P*. 0.0001) less than non-anemic group 3.09kg±0.66. The birth length of babies is 46.6cm ±2.30 significantly (*P*.0.0001) less than non-anemic group 48.1cm±1.19. Similarly, the head circumference was 32.5cm ±1.62 of the anemic mother's babies, significantly (*P*. 0.0001) less than non-anemic group 33.3cm±0.63.
CONCLUSION: It is concluded that the maternal hemoglobin plays an important role in the intrauterine growth of the neonates, affecting their anthropometric indices significantly.

KEY WORDS: Anemia, anthropometry, birth weight, birth length, head circumference.

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INTRODUCTION

Anemia is a predominant disorder in world in developed as well as under developed countries[1] it is highly prevalent in pregnancy[2] and leading cause of maternal and fetal deaths[3]. Risk factors for iron deficiency anemia (IDA) in pregnancy include poor diet[4], infectious disease and gastric disorders[1]. Nutritional deficiency during intrauterine life affects not only the body composition but also the linear growth[5]. The contributing factors can also be social causes, like early marriage, pregnancy at a young age, and poor spacing between successive pregnancies[6]. Anemia in pregnancy is hemoglobin (Hb) level <10.5 g/Dl[7]. The WHO cutoffs for anemia in pregnancy is 9-11 g/dl for mild, 7-9 g/dl for moderate, and < 7 g/dl for severe anemia[8]. Anemia is usually thought to be a common issue in pregnancy, the fetal outcome can have detrimental effects due to anemia, like growth retardation, and preterm birth[9]. The Anthropometric parameters in neonates is a helpful tool to manage baby's growth which is cheap and non-Invasive method to assess size and extent of body, that could be influenced by maternal diet pattern, foods and drinks they consume, and daily lifestyles[10]. Anthropometry is reliable for monitoring medical conditions, and monitoring various congenital anomalies[11]. This study was done to see the effect of anemia during pregnancy on fetal outcome with regard to anthropometric measurements.

METHODOLOGY

A cross sectional comparative study was conducted from September 2018 to August 2019 at the department of Physiology University of Sindh in collaboration with Liaquat University Hospital Hyderabad. Four hundred pregnant females were selected by convenient random sampling, aged between 18 to 40 years, and were admitted to deliver a baby at Gynae and obstetrics department, LUMHS, Hyderabad/ Jamshoro. Women less than 18, and above 40 years with the history of chronic disease, threatened abortion multiple pregnancies (female having singleton pregnancy were included in this study,females with twin pregnancy or more were excluded),still births, and drug abuse were excluded.
After obtaining written consent, pregnant females completed a schedule of general physical exam, blood

draws, and questionnaires. Pulse, blood pressure, and general physical examination was performed by standard protocols. The questionnaire consisted of demographic and socioeconomic information.

Blood samples of 5ml were collected from each participant by the chief investigator of study ,before delivery and stored in tubes (ATLAS-LABOVAC Itliano) containing EDTA(AK3EDTA) as an anticoagulant, at Diagnostic and Research Laboratory Liaquat University of Medical & Health Sciences, till tests performed complete blood picture (CBC) was performed by using CBC hematology analyzer Celltac Alpha MEK-6500 by Nihon Kohden Germany, in sterilized condition in Diagnostic and Research Laboratory Liaquat University of Medical & Health Sciences. Three parameters of anthropometry were measured for all the babies, which includes weight, length, and head circumference. The measurement was done immediately on the day the baby was born. Weight of the naked newborn babies was taken on weighing scale, length of the babies was taken with non-stretch measuring tapes, similarly the head circumference with the same tape in a manner that tape was passed around the widest part of the head. Fetal growth was assessed using reference charts for birth weight and length for gestational age, and infants were categorized low birth weight and length when their birth weight, and length is <3rd percentile for gestational age.

Data are provided as percentage, averages ± SD; Data were assessed by using SPSS 21.0 (IBM, Incorporation, USA) (Statistical package for social sciences), data presented as mean, percentages, standard deviation. The quantitative data was analysed using student's t-test and the qualitative data were analysed on Chi-Square, Fischer exact test, and Pearson test. Results with p<0.05 were considered statistically significant.

RESULTS

Total 400 pregnant mothers, out of 400 pregnant females 194(48.5%) were found non-anemic, 206 (51.5%) were anemic. The newborn were 198 males, and 202 females. In anemic group 98(47.5%) babies born were born low birth weight, and 108(52.4%) were of normal weight. In the non-anemic group,53(27.3%) were found to be low birth weight,141(72.6%) were of normal birth weight, as shown in **Table-I**.

It shows the hemoglobin status significantly (*P*.0.0084) affects the weight for age percentile of the newborn, where 98(47.5%) of the babies are less than 3rd percentile in the anemic group, and 53(27.3%) were below 3rd percentile in non-anemic group.

In Table-II, it is shown that, in anemic mothers 47 (11.75%) are mildly anemic, with 14(29.7%) low birth weight babies, and 33(70.2%) normal weight babies. A number of 103(25.75%) were moderately anemic with 62(60.1%) low birth weight and 41(39.8%) normal birth weight, 56 (14%) women were severely anemic with 22(39.2%) low birth weight and 34(60.7%), normal birth weight. The Chi-Square value is 14.08, and p value 0.0008 which shows statistically significant difference for birth weight among mild, moderate and severely anemic women.

In Table III anemic group 15(7.2%) babies born were decreased length i.e, less than 3rd percentile length for age, and 191(92.7%) were of normal length. In the non-anemic group, 4(2.06%) were found to have decreased length, 190(97.9%) were of normal length, showing hemoglobin status significantly (*P*. 0.04) affects the length for age percentile of the newborn.

Table-IV shows birth weight of babies in anemic mothers which is 2.45 kg±0.32 significantly (*P*. 0.0001) less than non-anemic group 3.09 kg±0.66. The birth length of babies was 46.6cm±2.30 significantly (*P*.0.0001) less than non-anemic group 48.1cm±1.19. Similarly, the head circumference was 32.5cm±1.62 of the anemic mother's babies significantly (*P*. 0.0001) less than non-anemic group33.3cm±0.63.

In Table V, strongly significant correlation was observed between the anthropometric indices of the newborn with the Hemoglobin of the mothers, showing there is increase in the birth weight and length of the newborn with increase in hemoglobin levels of mothers.

TABLE I: BIRTH WEIGHT FOR AGE PERCENTILE IN ANEMIC AND NO-ANEMIC MOTHERS

Weight for Age Percentile	Anemic Mothers n(%)	Non-Anemic Mothers n(%)	X^2 Chi-Square	*P*-Value
>97	3(1.47)	6(3.09)		
50-97	50(26.6)	65(33.5)		
30-50	55(29.1)	70(36)	17.82	0.0084
< 3rd	98(47.5)	53(27.3)		
Total	206	194		

TABLE II: BIRTH WEIGHT OF NEONATES ACCORDING TO THE DEGREE OF ANAEMIA OF MOTHERS

Anemia Overall Hb<11mg/dl	Low Birth Weight (wt≤2.5kg) n (%)	Normal Birth Weight (wt≥2.5 kg) n(%)	X^2 Chi-Square	*P*. value
Mild (Hb10 -10.9)	14(29.7%)	33(70.2%)		
Moderate (Hb7-9.9)	62(60.1%)	41(39.8%)	14.08	0.0008
Severe (Hb<7)	22(39.2%)	34(60.7%)		

TABLE III: BIRTH LENGTH FOR AGE PERCENTILE IN ANEMIC AND NON-ANEMIC MOTHERS

Length for Age Percentile	Anemic Mothers n(%)	Non-Anemic Mothers n (%)	X^2 Chi-Square	*P*- Value
>97	3(1.45)	1(0.5)		
50-97	70(33.9)	79(40.7)		
30-50	118(57.2)	110(56.7)	7.83	0.04
< 3rd	15(7.2)	4(2.06)		
Total	206	194		

TABLE IV: ANTHROPOMETRIC MEASUREMENTS OF NEONATES (MEAN±SD) AMONG ANEMIC AND NON-ANEMIC MOTHERS

Variables	Anemic Mother's Babies	Non Anemic Mother's Babies	t-test	*P-Value*
	(Mean±SD)			
Birth weight (Kg)	2.45±0.32	3.09±0.66	12.6	0.0001
Birth length (cm)	46.6±2.30	48.1±1.19	8.48	0.0001
Head Circum-ference (cm)	32.5±1.62	33.3±0.63	6.74	0.0001

TABLE V: PEARSON'S CORRELATION BETWEEN MATERNAL FACTORS AND BIRTH OUTCOMES

Maternal Factor	Birth Weight (Kg)		Birth Length (Cm)		Head Circumference (Cm)	
HEMOGLOBIN (g/dl)	Pearson's correlation	*P*-value	Pearson's correlation	*P*-value	Pearson's correlation	*P*-value
	0.489**	0.000	0.860**	0.000	0.942**	0.000

DISCUSSION

The prevalence of the anemia in pregnant women in this study was found to be 51.5%, which is less than which was found in India 72.5%[12] and Nigeria 61.2%[13] but greater than Iraq 42%[10], and South America 7.1% [14]. In this study, the mean birth weight and standard deviation among the anemic group was found as 2.45 kg±0.32, which is in close approximation with India[15] and Bangladesh[16], having birth weight of 2.34 kg±5.0 and 2.8 kg±4.6 respectively. In a study done by Sukrat B 2013[17] it was shown that hemoglobin less than 11 g dl increases the risk of low birth weight infants, which is consistent with the present study.

Consistent to the results of Nair B 2016[18], in this study no significant difference was found between anthropometry and birth weight of infants either male or female. In this study, the anemia significantly affected the birth weight and length, which is consistent to the study in Baghdad Iraq[19], but inconsistent with the results of Srinivas P 2015[20], and Abeysena C 2010[21] that showed that there is no effect of maternal anemia on the anthropometric indices of newborn.

In this study the correlation between hemoglobin and birth weight, birth length and head circumference were significant, showing with the increase of maternal Hb level the birth weight and length of the newborn will also increase which is also suggested by Al-Hajjiah N 2018[10], showing strong correlation between maternal hemoglobin with birth weight.

CONCLUSION

It is concluded from this study that the maternal hemoglobin plays an important role in the intrauterine growth of the neonates, affecting their anthropometric indices significantly.

RECOMMENDATIONS

It is recommended that the same study pattern should be repeated with larger sample size to ascertain the results.

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AUTHOR CONTRIBUTIONS

Shah T: Manuscript writing
Warsi J: Analysis & interpretation of data
Laghari Z: Study concept, design

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