Some Maternal Factors Affecting Anthropometric Measurments of Newborns

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ABSTRACT:

BACKGROUND:

Fetal growth may at any time during gestational period be affected by several factors that may cause diseases to fetuses or neonates, and interfere with neonatal morbidity and mortality. Among these factors are racial, genetic, socioeconomic factors and maternal malnutrition and illnesses like diabetes, preeclampsia and anemia.

OBJECTIVES:

Our aim is to study the effect of maternal height, age, and illnesses on the anthropometric measurements of full term singleton newborns.

METHODS:

Two hundred full term singleton newborns were studied cross-sectionally in the maternity wards of 2 hospitals in the medical city /Baghdad .They were assessed by measuring the newborn weight, length and occipitofrontal circumference using standard methods of measurements. The gestational age was assessed by simplified Ballard-Dubowitz method. Mother's height was also measured. The maternal illnesses during pregnancy were listed in special questionnaire form. Statistical analysis was done by statistician.

RESULTS:

Of 200 full term singleton newborns, 109 (54.5%) were females and 91 (45.5%) were males. Mean body weight of males was 2850 grams, while that of females was 2600 grams. Mean length of males was 48.75 cms, while that of females was 48 cms. Mean OFC of males was 34.5 cms, while that of females was 33.5 cms. The weight of males was more than that of females at maternal height of 140-150 cms, 161-170 cms and 171-180 cms. Males were longer at maternal height of 161-180 cms. Males had higher OFC than females at maternal height of 161-180 cms. Males were lighter in weight than females of preeclamptic mothers, but no such effect on length and OFC. Maternal anemia also affect mainly newborn s` weight. There is no effect of other maternal diseases on weight, length, and OFC. The largest number and heaviest weight of newborns were at maternal age of 26-35 years, while male newborns of extreme maternal ages being longer than females. No effect of maternal age on OFC.

CONCLUSIONS:

In this study, we found more female newborns than males, and the mean weight, length and OFC of males were greater than that of females, and the heaviest newborns were at maternal height of 170-180 cms .Maternal preeclampsia and anemia affecting newborns weight mainly. Maternal age of 26-35 years gave heavier newborns. We recommend improving the maternal antenatal care, nutrition, and controlling maternal illnesses to improve the neonatal anthropometric measurements, and also recommend making wide national study to construct and apply local intrauterine growth curves specific to our country.

KEYWORDS: Mothers, newborns, anthropometric measurements, height, length, weight, occipitofrontal circumference.

INTRODUCTION:

Full term neonates are those born after 37 up to 41 weeks of gestation calculated from last menstrual period .Their normal Birth weight (B. WT) is 2500-3999 grams (grs)**.** Normal length is 50 cms (95% of them 46-56 cms). Normal occipitofrontal circumference (OFC) is 35 cms (95% of them 33-38 cms)**.** Low B.WT is less than 2500 grs.

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A full term newborns with low B.WT is called intrauterine growth retardation (IUGR), which is failure of normal fetal growth caused by multiple adverse effects on the fetus, they accounts for 1/3 of low B. WT, whereas small for gestational age (SGA) is newborns with B. WT less than 10th centile for his gestational age .Term newborns with B. WT less than 3rd centile is associated with higher morbidity and 10 times higher mortality than AGA (appropriate for gestational age). [1, 2, 3] Fetal growth may at any time during the gestational

period be affected by several factors that can cause significant or minimal losses of fetuses. Maternal or environmental restrictive factors acting early in fetal life may damage the fetal cell population. Accordingly, these factors may cause diseases to either fetus or neonate and interfere with neonatal morbidity. [1, 2, 3, 4, 5] Although maternal malnutrition and B. WT appear to be causally related, genetic and racial factors are also important in B. WT determination. [6, 7, 8, 9] Maternal diseases like diabetes can affect the fetus causing fetal death in last trimester, and large for gestational age newborns (LGA), while preeclampsia, chronic hypertension, renal disease result in SGA, prematurity, intrauterine death. Uncontrolled maternal hypothyroidism or hyperthyroidism can lead to abortion, premature labor and fetal death. [1, 2, 3, 4, 5] There are several methods for evaluating intrauterine growth includes;

1. Physical appearance. There are two types of IUGR, the first is called symmetrical IUGR where all B. WT, length, OFC are reduced due to illness that started early in pregnancy with special appearance .The ponderal index is usually normal in this type. The second type is a symmetrical IUGR in which only the B. WT is affected so that the head appear large compared to weight. [1, 2]
2. Ballard score. [3]
3. Curves relating B. WT to gestational age with less than 10th centile being SGA newborns. [1, 2, 3, 9, 10]
4. Other measures includes weight for length ,weight /length index ,ponderal index ,body mass index ,skin fold thickness , placental weight. [11, 12, 13, 14, 15]
5. Growth between two ultrasound examinations can be used to estimate the risk of neonatal morbidity even when the gestational age is unknown. [16] Until more contemporary curves are available , we use the lubchenco intrauterine growth curves because they are based on reasonably size sample ,provide curves to monitor weight ,length, OFC , and are easy to use and predict. [9, 10, 17] There might be a need to construct local intrauterine growth curves, because of differences in race, geography and economy. [6, 7, 18] The aim was to study the effect of maternal age, height and illnesses on anthropometric measurements of singleton full term newborns.

PATIENTS AND METHODS:

Cross-sectional study was carried out in the maternity ward of Baghdad Teaching Hospital and Nursing Home Hospital (medical city / Baghdad) during the period from first of June 2004 up to end of June 2005. Two hundred healthy newborns were assessed by anthropometric measurements (weight, length, and Head circumference), with three days per week for collection of newborns data. All the newborns were full term, delivered by normal vaginal delivery and caesarean section. Multiple pregnancies were excluded from this study. For assessment of gestational age of newborns, the simplified Ballard-Dubowitz method was used with only 6 external criteria even when the newborn was neurologically depressed depending on ear firmness, breast size, skin colors, skin opacity, genitalia and planter creases, after doing the Moro reflex which appear at 28 weeks of gestation so collected the score and add it to 28 weeks to find the actual gestational age with a reliability of ± 2 weeks. The weight of newborns was measured using a standard Seca mechanical scale (maximum 16 kg), measured to the nearest 50 grams. The length of newborns was measured using length stadiometer measure board-100cm-US made by putting the newborn supine on measuring board with legs fully extended at hip and knee joints and the distance between crown and heel was measured to the nearest 0.5 cm . The head circumference was measured using a tape measure to the nearest 0.5cm (maximum 56cm). The height of mothers was measured using a tape measure held on the wall and height was measured from heel on earth up to crown of the mother by plastic umbrella movable with tape. The history was taken from the mother according to standard questionnaire form designed to investigate the epidemiological and clinical information .This form includes ;maternal age, height ,antenatal care ,illnesses during pregnancy (preeclampsia , diabetes , anemia and others) , mode of delivery ; and neonatal sex , B. WT ,length , OFC . All informations were taken by one person (the investigator) through person to person interview. Statical analysis was done by statistician and the test used is Chi square and F test to find P value and P value < 0.05 regarded as significant.

RESULTS:

Of two hundred full term singleton newborns, who were studied cross sectionally, in the maternity ward of both Baghdad teaching hospital and nursing home of medical city, 109(54.5%) were females and 91(45.5%) were males. Mean body weight of male newborns was 2850 grs; while that of females was 2600 grs .Mean length of males was 48.75 cms, while that of females was 48 cms. Mean OFC of males was 34.5 cms, while that of females was 33.5 cms. The effect of maternal height on weight of newborns show that the weight of males more than females at maternal height of 140-150cm,161-170cm and 171-180cm , and the highest percent of newborns at maternal height of

161-170cm were 86 (43%) (Table1). The effect of maternal height on length of newborns show that males were longer at maternal height 161-180cm and female newborns were longer at maternal height 151-160cm and equal in length of 140-150cm (Table 2). The effect of maternal height on OFC of newborns shows that male newborns had a higher OFC than females at maternal height of 161-180cm (Table 3). The effect of 30 preclamptic mothers on weight of newborns and in comparison with 123 normal healthy mother show that male newborns lighter in weight than females of Preeclamptic mother ,and the number of newborns below 0.4 th centil was 21 (70%) of Preclamptic mother . while in healthy mothers, the number of newborns below 0.4 th centile was 23 (18%) ,which is (11.5 %) from total (Table 4) .(Blood pressure was checked in 153/200 mothers(76.5%)) . The effect of 30 Preeclamptic mothers on OFC shows that males & females are equal in number & approximately equal in OFC below 0.4th centile (Table 5). The effect of Preclamptic mothers on the length of newborns show males were longer than females below & above 0.4 th centil, while females more in number above 0.4 th centil than male newborns (Table 6) . The effect of 22 anemic mothers on weight of newborns show that females below 0.4 th centil were lighter in weight than male newborns & number of newborns of anemic mother 14 (63%), which is(7%) of total below 0.4 th centil in comparison to 123 healthy mothers (Table7). (Hemoglobin level was checked in 145/200 mothers (72.5%)). The effect of anemic mothers on OFC of newborns shows those newborns above 0.4 th centil of OFC more in number (63%) of anemic mothers. and females more in number than in males while males higher in head circumference above & below 0.4 th centil of OFC (Table 8). The effect of anemic mother on length of newborns shows that female newborns higher in number than male newborns above and below 0.4 th centil in comparison to healthy mother that male newborns more in number & female more in number than male above 0.4 th centile.
(Table 9) There is no effect of other diseases of pregnant women on anthropometric measurements of their newborns (Diabetes mellitus, Asthma, Heart problems, and Epilepsy), as most newborns were above 0.4th centil of weight, OFC, and length. The effect of maternal age on weight of newborns show that largest number and the heaviest weight of newborns were at age 26-35 years. (Table 10) There is no effect of maternal age on OFC of newborns. The effect of maternal age on length of newborns showed male newborns of extreme ages being longer than females.

Table 1: The effect of maternal height on Weight of newborns

Maternal height CM	total no./%	mean/wt /Female/g	mean/wt /Male/g	No. Female	No. Male
140-150	17(8.5%)	2500	2800	9	8
151-160	81(40.5%)	2750	2500	48	33
161-170	86(43%)	2350	3000	42	44
171-180	16(8%)	2850	3100	10	6

P= 0.412

Table 2 : The effect of maternal height on length of newborns

Maternal height CM	total no./%	mean length/Female cm	mean length/male	no .Female	No. Male
140-150	17(8.5%)	47	47	9	8
151-160	81(40.5%)	49	47	48	33
161-170	86(43%)	48	49	42	44
171-180	16(8%)	48	50	10	6

P=0.342

Table 3: The effect of maternal height on head circumference of newborns

Maternal height CM	total no./%	mean HC/female/cm	mean HC/male/cm	no .Female	No. Male
140-150	17(8.5%)	33	34	9	8
151-160	81(40.5%)	34	33	48	33
161-170	86(43%)	33	35	42	44
171-180	16(8%)	34	36	10	6

P=0.341

Table 4: The effect of preclamptic mother on weight of newborns

Preclamptic mother (no. 30)					Normal healthy mother (no. 123)				
wt/g	Female/g	Male/g	no.	%	mean wt	Female/g	Male/g	no.	%
≤ 2300	2200	2100	21	10.5	≤ 2300g	2200	2250	23	11.5
>2300	2900	2850	9	4.5	> 2300g	3150	3050	100	50
			30	15%				123	61.5%

P=0.00002

Table 5 : The effect of preclamptic mother on head circumference of newborns

Preclamptic mother(no. 30)				Normal healthy mother(no. 123)			
	mean HC/cm	no.	%		mean HC/cm	no.	**%**
HC/female ≤31	31	4	2	HC/female ≤31	0	0	0
HC/male ≤32	31.5	4	2	HC/male ≤32	32	6	3
HC/female >31	33.5	15	7.5	HC/female >31	34	62	31
HC/male >32	33.5	7	3.5	HC/male >32	35	55	27.5
		30	15%			123	61.5%

P=0.00016

Table 6: The effect of preclamptic mother on the length of newborns

Preeclamptic mother(no. 30)				Normal healthy mother(no. 123)		
cm	mean length	no.	%	mean length	no.	%
female≤45	44	5	2.5	44.5	2	1
male ≤47	45	6	3	46	11	5.5
female>45	48	14	7	49	60	30
male>47	49	5	2.5	49.5	50	25
		30	15%		123	61.5%

P=0.0004

Table 7: The effect of anaemic mother on weight of newborns

Anemic mothers(no.22)					Normal healthy mother (no. 123)			
wt/g	female/wt/g	male/wt/g	no.	%	Female wt/g	Male wt/g	no.	%
≤ 2300	2000	2300	14	7	2200	2250	23	11.5
>2300	2700	2350	8	4	3150	3050	100	50
			22	11%			123	61.5%

P=0.0000008

Table 8 : The effect of anaemic mother on head circumference of newborns

	Anemic mother (no. 22)			Normal health mother(no. 123)		
cm	mean/HC	no.	%	mean/HC	no.	%
female ≤31	30.5	4	2.0	0	0	0
male ≤ 32	32	1	0.5	32	6	3
female>31	33	14	7	34	62	31
male>32	34	3	1.5	35	55	27.5
		22	11%		123	61.5%

P=0.0041

Table 9 : The effect of anaemic mother on length of newborns

	Anemic mother (no. 22)			Normal health mother(no. 123)		
cm	**mean/length**	no.	%	mean/length	**no.**	**%**
female ≤45	44	8	4	44.5	2	1
male ≤ 47	47	4	2	46	11	5.5
female>45	47.5	10	5	49	60	30
male>47	0	0	0	49.5	50	25
		22	11%		123	61.5%

P = 0.00005

Table 10: Effect of maternal age on weight of newborns

maternal age year	no.	%	mean wt female/g	mean wt male/g
15-25	72	36	2500	2450
26-35	100	50	2700	2750
36-45	28	14	2450	2500
	200	100%		

P= 0.24

Table 11: The effect of maternal age on length of newborns

maternal age year	no.	%	mean female length	mean length male
15-25	72	36	46	49
26-35	100	50	48	48
36-45	28	14	47	49
	200	100%		

P=0.342

DISCUSSION:

Intrauterine growth curves are extremely useful for classifying newborns and predicting neonatal diseases. However, such curves rely on knowledge of the gestational age, which is not always easily obtained [9, 10]. Therefore the study of other anthropometric measurements and their interrelationship is always desirable, in order to attain such objectives. [5, 11, 12, 13, 14, 15] Females are higher in number than males and healthy mothers more than diseased mothers. In table 1,2and 3, the effect of maternal height on anthropometric measurements of newborns show that mothers taller than 171cm show heavier weight, larger head OFC and length of newborns in comparison to other heights of mothers. Newborns were higher in number at mother height 161-170cm than other heights of mothers. Male newborns were heavier and longer than females in this study.

This may be due to the fact that males weight increase about 150-200 grs more than females at birth, this increase occurs late in gestation. [2]. Table 4 show the effect of preeclampsia on anthropometric measurements of newborns and their effect mainly on weight of newborns, while anemic mothers affecting weight and length of newborns and not affecting OFC.

The other diseases (Diabetes mellitus, Asthma, Heart problems and Epilepsy) had no effect on measurements of newborns except diabetic mothers who gave newborns of heavier weight.

This agrees with Brigham and women s hospital results (1983-1984), in which the incidence of macrosomia in infants of diabetic mothers was 28%. [19]. It also agrees with Hanoudi study (2006), in which a significant effect of maternal diabetes on newborn birth weight was found. [20] In this study maternal diseases and their effect on anthropometric measurements of newborns showed that maternal diseases like preeclampsia and anemia affecting the weight of newborns in both sexes with their weight lighter than newborns of healthy mothers. These results agrees with the Sao Paulo study (Brazil) during the period from February 1995 to January 1998, in which 8397 live newborns were studied in hospitals maternity ward, and main measurements were birth weight and length, weight for length adequacy and weight/length index and frequent neonatal diseases in this population and the results showed a significant association of adequacy and index with neonatal diseases. [4, 15] In this study, there was no effect of maternal age on anthropometric measurements of newborns except that newborns weight is heavier to mother's age between 26-35 years of age, possibly because this is the ideal age for pregnancy. This disagrees with New Jersey statistics, which showed a highest incidence of low B. WT in maternal age under 15 years.

This may possibly be related to racial, genetic and socioeconomic differences. [6, 7, 8] The difference between our mothers and the Indian and that of western countries is also noted in another study of 631 term babies born in six rural villages near the city of pure, Maharashtra. India , and 338 term babies born in the princess Anne hospital, Southampton UK, where the maternal height and weight and neonatal weight ,length ,head ,mid-upper-arm and abdominal circumference, Sub scapular and triceps skin fold thickness and placental weight were studied (February 2003), the results showed that the Indian mothers were younger ,lighter, shorter and had lower mean body mass index than Southampton mothers who gave babies heavier in all body measurement than Indian babies [21,22]. This also agrees with the fact that racial, geographical, socioeconomic factors in addition to maternal malnutrition affect birth weight and other parameters, and the need to construct and apply local intrauterine growth curves. [6, 7, 8, 18] In this study only maternal height were taken and showed that male babies heavier than female in relation to increased maternal height. This may be due to the familial and genetic effects of increased maternal height, and also because of already higher B. WT of males over females at birth. [2, 6, 7, 8] .

CONCLUSION:

Females were more in number than males , but males were heavier, longer and had larger OFC ,and taller mothers gave heavier ,longer and larger OFC of males, and that preeclampsia and anemia of mothers result in lighter newborns, and the extreme maternal age gave longer newborns, while maternal age of 26-35 years gave heavier newborns. We recommend to improve the antenatal care and the maternal nutrition and to control the maternal illnesses especially preeclampsia and anemia, so that it will improve the neonatal anthropometric measurements ,and also recommend a wide national study of intrauterine growth parameters to construct and apply local curves specific to our country .

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