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## A study of effects of maternal age on anthropometric measurements of Newborns

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### Abstract

**Background:** Advanced maternal age deserves special attention. Epidemiological studies suggest that there is a change in developing countries to delay the age of first pregnancy but maternal age above 35 years for first pregnancies is associated with reduced intrauterine fetal growth

**Aims & Objectives:** The aim of present study to find out the effects of maternal age on Anthropometric measurements of newborn in western Rajasthan, India.

**Methods:** The Study carried was carried out on 1019 mothers and their newborn at Ummed Hospital, Dr. Sampurnanand Medical College Jodhpur, Rajasthan. Maternal age was divided into three groups that were Group I included mothers of age below 20 years, in Group II age of mother was ranging between 20 to 30 years and in III Group age was above 30 years. Anthropometric measurements of newborn included the weight, length, head, mid arm, chest, thigh, calf circumferences and skin fold thickness of neonates.

**Conclusion:** In this study it was found that 23.45% of mothers were below 20 years (teenage pregnancy) and LBW rate was high and mean birth weight was low. Best age for conception is 20 to 30 years of age. So by discouraging teenage pregnancies, proper spacing (2y), and LBW rate can be reduced.

**Keywords:** Maternal age, birth weight, LBW.

### 1. Introduction

Advanced maternal age deserves special attention. Epidemiological studies suggest that there is a change in developing countries to delay the age of first pregnancy but maternal age above 35 years for first pregnancies is associated with reduced intrauterine fetal growth <sup>[1]</sup>.

In our country many women continue to have children because they yearn for large families. The impact of advanced maternal age and parity on pregnancy outcome has become increasingly important. Traditionally, these advanced maternal age women are considered to have higher incidence of obstetric complications and adverse pregnancy outcomes than younger pregnant women <sup>[2]</sup>. Some controversy still exists in the literature on the pregnancy outcomes at advanced maternal age. Some researchers <sup>[3, 4]</sup>, have suggested compromised pregnancy outcome while others <sup>[2, 3, 4, 5]</sup> have reported comparable outcome for this subgroup <sup>[6]</sup>.

Anthropometric studies in children are important: the periodic measurements of anthropometric variables are affected by maternal factors like maternal anthropometric measurement, maternal clinical conditions, maternal life style etc. Fetal, maternal, placental and environmental factors may all influence fetal growth <sup>[3, 4]</sup>. The aim of our study was to find out the effects of maternal age on anthropometric measurement of newborns.

### 2. Materials and Methods

Present study was conducted at department of Anatomy, Dr. Sampurnanand Medical College Jodhpur, and Rajasthan, India. The Study carried out on 1019 mothers and their newborns at Ummed Hospital. The hospital data (obstetric history) and clinical condition were recorded from the tickets of mother and their newborns.

Maternal age was divided into three groups that were Group I included mothers of age below 20 years, in Group II age of mother was ranging between 20 to 30 years and in III Group age was above 30 years.

The study was performed by measuring the length, weight, head circumference, mid arm circumference, chest circumference, thigh circumference, calf circumference and skin fold thickness of the neonates.

Birth weight with naked neonate in supine position was obtained soon after birth by digital scale with 10 gram subdivision. Other anthropometric variable including chest, head

circumferences, thigh circumference, calf circumference, were measured by non-extendable measuring tape, with a width of 1.0 cm and subdivisions of 0.1 cm. and birth length was measured by infantometer, head circumference was obtained by placing tape along the largest occipito-frontal diameter along over the occiput and eyebrow.

The chest circumference was measured by placing measuring tape along the point of nipples. The length was measured with the newborn in supine position with full extension of knee and distance between top of head and heel when pressed against a vertical surface and role on a stabilizing board was measured.

Mid-arm circumference was measured the circumference perpendicular to the long axis of the upper arm midway between shoulder and elbow.

For the thigh circumference the infant lies on back with left leg extended for measurement of thigh circumference. With use of measuring tape, we measured the circumference of the left leg midway between the abdomen-thigh flexure crease and the knee. An assistant is required to assure that the infant is in the correct position.

Calf circumference was measured the maximum circumference at the level of the greatest posterior protrusion of the calf.

Skin fold was measured over the posterior belly of the triceps muscle of the left arm, half-way between the acromion and the olecranon, on a line passing upwards from the olecranon in the axis of the limb (Tanner and Whitehouse, 1975), with the arm held by the side of the body with the elbow extended.

Ethical clearance and approval for conducting this study was obtained from the ethical committee of the Rajasthan University of Health Sciences and correspondent hospital's ethical board committees. Prior informed consent was obtained from the mothers participating in this study after full explanation of the study.

The data were analyzed on Graph Pad Prism software and expressed as mean  $\pm$  S.D (n=6). Statistical multivariate analysis was performed by ANOVA test. The results were considered statistically significant, if  $p < 0.05$ . The level of significance was considered as under:

\*Significant  $p < 0.05$ , \*\*Highly significant  $p < 0.001$ , Non-significant  $p > 0.05$ .

### 3. Observation

Present study was carried out on 1019 mothers just after delivered and their newborn. Observation were showing in the table number 1, 2 and 3.

### 4. Discussions & Results

Present study shows that out of 1019 mothers, 239 (23.45%) were included in age group I (age less than 20 years), 686(67.32%) were included in age group II (21 to 30 years) and 94(9.22%) were included in age group III (above 30 years) (Table No1).

Distribution of age of newborn shows that in age group I there were 155(64.85%) with having normal birth weight, 64(26.77%) having low birth weight, 9(3.76) were very low birth weight, 1(0.41%) was extremely low birth weight, 1 (0.41%) was high birth weight, 7(2.92%) were still born and 2(0.82%) were born with congenital anomalies (Table No.2).

New born distribution was in age group II (age between 21 to 30 years) there were 463(67.49%) were having normal birth weight, 64(23.32%) were having low birth weight, 32(4.66%) were very low birth weight, 7(1.02%) was extremely low birth weight, 11(1.6%) were still born and 13(1.89%) were born

with congenital anomalies (Table No.2).

New born distribution was in age group III (age above 30 years) there were 42(44.68%) were having normal birth weight, 27(28.72%) were having low birth weight, 3 (3.19%) were very low birth weight, 1(1.06%) was extremely low birth weight, 7(7.44%) were still born and 14(14.89%) were born with congenital anomalies (Table No.2).

Incidence of low birth weight was more in mother below 20 years and after 30 years and it decreases with increase in maternal age from 20 to 30 year when we compared with other studies it was matched with the work of other studies (Table No.4).

Shah UP (2013) *et al* reported that incidence of low birth weight in advance maternal age (<25years) was higher than older maternal age (>25years) as we compare with present study it was not similar.

Anthropometric measurements of age group I (age less than 20 years) male newborn were; the mean ( $\pm$ SD) value of weight was 2.53( $\pm$ 0.64) kg, length was 46.76( $\pm$ 3.68) cm, head circumference 34.24( $\pm$ 3.14) cm, mid arm circumference was 9.84( $\pm$ 2.59) cm, chest circumference was 30.62( $\pm$ 4.41) cm, thigh circumference was 13.75( $\pm$ 3.26) cm, calf circumference was 9.05( $\pm$ 1.72) cm and skin fold thickness was 3.15( $\pm$ 1.66) mm. While anthropometric measurements of age group I (age less than 20 years) female newborn were; the mean ( $\pm$ SD) value of weight was 2.55( $\pm$ 0.65) kg, length was 46.45( $\pm$ 3.66) cm, head circumference was 33.77( $\pm$ 2.97) cm, mid arm circumference was 9.97( $\pm$ 2.27) cm, chest circumference was 29.89( $\pm$ 3.75) cm, thigh circumference was 13.59( $\pm$ 2.86) cm, calf circumference was 8.97( $\pm$ 2.7) cm, and skin fold thickness was 2.96( $\pm$ 1.3) mm (Table No.3).

Anthropometric measurements of age group II (age between 21 to 30 years) male newborn were the mean ( $\pm$ SD) value of weight was 2.63( $\pm$ 0.63) kg, length was 47.35( $\pm$ 3.94) cm, head circumference 34.46( $\pm$ 5.5) cm, mid arm circumference was 9.99 ( $\pm$ 4.05) cm, chest circumference was 30.41( $\pm$ 7.41) cm, thigh circumference was 13.59( $\pm$ 2.86) cm, calf circumference was 9.07 ( $\pm$ 1.73) cm, and skin fold thickness was 3.05 ( $\pm$ 1.54) mm. While anthropometric measurements of age group II (age between 21 to 30 years) female new born were the mean ( $\pm$ SD) value of weight was 2.55( $\pm$ 0.69) kg, length was 46.55( $\pm$ 4.16) cm, head circumference was 34.02( $\pm$ 2.92) cm, mid arm circumference was 9.37( $\pm$ 1.82) cm, chest circumference was 30.5( $\pm$ 3.91) cm, thigh circumference was 13.69 ( $\pm$ 3.01) cm, calf circumference was 9.17( $\pm$ 2.24) cm, and skin fold thickness was 3.05( $\pm$ 1.38) mm (Table No.3).

Anthropometric measurements of age group III (age above 30 years) male new born were the mean ( $\pm$ SD) value of weight was 2.54( $\pm$ 0.69) kg, length was 47.28( $\pm$ 3.61) cm, head circumference 34.38( $\pm$ 3.18) cm, mid arm circumference was 9.28 ( $\pm$ 1.42) cm, chest circumference was 30.61( $\pm$ 4.26) cm, thigh circumference was 14.7( $\pm$ 4.2) cm, calf circumference was 9.26 ( $\pm$ 1.5) cm, and skin fold thickness was 2.61 ( $\pm$ 1.01) mm. While anthropometric measurements of age group III (age above 30 years) female new born were the mean ( $\pm$ SD) value of weight was 2.32( $\pm$ 0.57) kg, length was 45.72( $\pm$ 3.29) cm, head circumference was 33.84( $\pm$ 2.98) cm, mid arm circumference was 9.28( $\pm$ 1.42) cm, chest circumference was 29.64( $\pm$ 3.1) cm, thigh circumference was 14.36 ( $\pm$ 2.51) cm, calf circumference was 8.72( $\pm$ 1.56) cm, and skin fold thickness was 3.00( $\pm$ 1.44) mm (Table No.3).

On the multivariate analysis by ANOVA test, maternal age had significant ( $p < 0.05$ ) effects on length of neonates. (Table No.3)

Mean birth weight was less in mothers below 20 years and after 30 years and it increases with increase in maternal age from 20 to 30 years in present study as we compared with other studies it was slightly different that as the maternal age increase birth weight increases (Table No.5).

Feleke Y *et al* (2015) reported that maternal age had significant effect only on birth weight of neonates as we compare with present study maternal age had significant effects only on length of the neonates.

Shami S A *et al*. concluded that advance maternal age has highly significant negative effects on male birth weight and non-significant positive effects on female (p>0.1) birth weight as we compare to present study it was similar.

Satwanti Kapoor *et al*. (2012) [5] reported that maternal age has highly significant negative effects on birth weight, length and skin fold thickness of new born and non-significant positive effects on head circumference, chest circumference, mid arm circumference and thigh circumference as we compare to present study it was closely similar.

Sylvia K *et al* (2003) [6] observed that the offspring of extremely young mother age 12 to 16 years were significantly

(p<0.0001) lighter and smaller in all body dimension than the offspring of older adolescent mothers, age 17-19 years, and the offspring of adult gravid, age 20-29 years although no increased incidence of low birth weight newborn.

Eltahir M E *et al*. (2008) [7] found that maternal age was positively correlated (p<0.001) with birth weight as we compare with present study not similar.

H Shajari *et al*. (2006) [3] seen in his study that mean birth weight, length and head circumference was higher in older group (>20) of maternal age than the younger age group (<20) as we compare with present study it was similar.

**Table 1:** Distribution of Mothers According to their Age.

S. No.	Age group	Maternal Number	Percentage
1	I Age group	239	23.45%
2	II Age group	686	67.32%
3	III Age group	94	9.225%
Total		1019	

**Note:** I Age group included less than 20 years maternal age  
 II Age group included maternal age between 21 to 30 years  
 III Age group included maternal age above 30 years.

**Table 2:** Effects of Maternal Age on New born Distributions.

S. No.	Distribution of New Born	New born of Age Group I (Maternal Age <20 yrs)		New born of Age Group II (Maternal Age (20-30))		New born of Age Group III (Maternal Age >30)	
		n	%	n	%	n	%
1	Normal	155	64.85%	463	67.49%	42	44.68%
2	Low Birth Weight	64	26.77%	160	23.32%	27	28.72%
3	Very Low Birth Weight	9	3.76%	32	4.66%	3	3.19%
4	Extremely Low Birth Weight	1	0.41%	7	1.02%	1	1.06%
5	High Birth Weight	1	0.41%	0	0%	0	0%
6	Still Born	7	2.92%	11	1.6%	7	7.44%
7	Incidence of Congenital Anomalies	2	0.82%	13	1.89%	14	14.89%
Total		239		686		94	

**Table 3:** Effects of Maternal Age on New Born Anthropometry.

S. No.	New Born parameters	New born of Age Group I (Maternal Age <20 yrs)		New born of Age Group II (Maternal Age (20-30))		New born of Age Group III (Maternal Age >30)		Statistical Analysis (ANOVA Test)	
		Male (Mean±SD)	Female (Mean±SD)	Male (Mean±SD)	Female (Mean±SD)	Male (Mean±SD)	Female (Mean±SD)	F value	p value
1	Weight(kg)	2.53±0.64	2.55±0.65	2.63±0.63	2.55±0.61	2.54±0.69	2.32±0.57	1.78	0.11
2	Length(cm)	46.76±3.68	46.45±3.66	47.35±3.94	46.55±4.16	47.28±3.61	45.72±3.29	2.45	<b>0.03*</b>
3	Head Circumference(cm)	34.24±3.14	33.77±2.97	34.46±5.5	34.02±2.92	34.38±3.18	33.84±2.98	0.72	0.60
4	Mid Arm Circumference(cm)	9.84±2.59	9.97±2.27	9.99±4.05	9.37±1.92	10.01±2.23	9.28±1.42	1.7	0.11
5	Chest Circumference(cm)	30.62±4.41	29.89±3.75	30.41±7.41	30.5±3.91	30.61±4.26	29.64±3.1	0.37	0.86
6	Thigh Circumference(cm)	13.75±3.26	13.76±3.2	13.59±2.86	13.69±3.01	14.7±4.2	14.36±2.51	1.71	0.12
7	Calf Circumference(cm)	9.05±1.72	8.97±2.7	9.07±1.73	9.17±2.24	9.26±1.5	8.72±1.56	0.47	0.79
8	Skin Fold Thickness(mm)	3.15±1.66	2.96±1.3	3.05±1.54	3.05±1.38	2.61±1.01	3±1.44	1.43	0.20

**Note:** p>0.05 (Non-significant), \* p<0.05 (Significant), \*\*p<0.01(Highly Significant)

**Table 4:** Comparison of Maternal Age in Years and Low Birth Weight in Various Studies.

Study	<20 years	20-30 years	>30 years
Guvande UH (1994)	41.9%	32.5%	50.7%
Nair NS (2000)	20.9%	14.4%	13%
Kiran A (2000)	41.5%	35.8%	35%
Negi KS (2006)	36.4%	22.6%	15.4%
Lohitha (2012)	44.9%	40.2%	47.2%
Present Study(2015)	26.77%	23.32%	28.72%

**Table 5:** Comparison of maternal age and birth weight in Various Studies.

Study	<20 years	20-30 years	>30 years
Shanthi G (1977)	2.65kg	2.74 kg	2.88kg
Samiran B S(2006)	2.45kg	2.61kg	2.64kg
Shajari H (2006)	2.97kg	3.14kg	3.25kg
Lohitha (2012)	2.51kg	2.68kg	2.63kg
Present study(2015)	2.54kg	2.59kg	2.43kg

## 5. Conclusion

Age of mother in the present study varies from 16 to 42 years. Maximum number of women belongs to age group II. This was statically significant because this is the most fertile period of life, and lowest in age group III (above 30 years).

Percentage of new born with normal birth weight and very low birth weight was highest in age group II and lowest in age group III. Percentage low birth weight, extremely low birth weight, still born and new born with congenital anomalies were highest in mothers of age group III. Incidence of low birth weight still born and congenital anomalies was lowest in new born of mothers of age group II.

Mean value of weight, length, head circumference, were highest in male new born of age group II and lowest in female new born age group III except head circumference which was lowest in female new born of mothers of age group I. Mean value of mid arm, thigh, and calf circumference was highest in male and lowest in female new born of age group III except thigh circumference which was lowest in male new born age group II new born. Mean value of chest circumference and skin fold thickness was highest in male new born of age group I and lowest in female new born of age group III

On the multivariate analysis by ANOVA test, maternal age was highly significant ( $p < 0.01$ ) effects on birth length.

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