



## MATERNAL ANTHROPOMETRY AND ITS RELATIONSHIP WITH BIRTH WEIGHT OF NEONATES

Meghali Joharapurkar<sup>1</sup> and Rekha Sharma<sup>2</sup>

- 1) Department of Food and Nutrition, Sevalal Mahila Mahavidyalaya, Nagpur, jmeghali@gmail.com  
 2) UGC- Human Resource Development Centre, Rashtrasant Tukadoji Maharaj, Nagpur University, Nagpur, drrekha\_sharma2000@yahoo.com

### Abstract

Anthropometric indicators may be reflective of past events, predictive of future events, or indicative of current nutritional status. To determine the relationship between maternal anthropometric measurements and birth weight of new born, 215 pregnant women in the last trimester were selected from Government Hospitals of Nagpur City. A structured questionnaire was developed which consisted of questions related to demographic and socioeconomic profile and anthropometric measurements. Interview cum questionnaire method was used for eliciting information. The maternal anthropometry viz., height, weight and mid arm circumference were recorded as per standard methods. The birth weight was taken from the hospital records. The results of the study showed that the maternal anthropometric measurements of mothers viz., height ( $r = 0.232$ ,  $p < 0.01$ ), pre-pregnancy weight ( $r = 0.342$ ,  $p < 0.01$ ), last trimester weight ( $r = 0.454$ ,  $p < 0.01$ ), gain in weight ( $r = 0.427$ ,  $p < 0.01$ ), mid upper arm circumference ( $r = 0.471$ ,  $p < 0.01$ ) and Body Mass Index ( $r = 0.246$ ,  $p < 0.01$ ) had positive and significant correlations with birth weight of infants.

**Keywords** :Pregnancy, Birth weight, maternal anthropometry, pre-pregnancy weight, Body Mass Index.

### Introduction

Anthropometric indicators may be reflective of past events, predictive of future events, or indicative of current nutritional status. Birth weight is closely associated with the health and survival of the newborn. The relationship between maternal malnutrition and consequent low birth weight babies and the prenatal morbidity and mortality is now an accepted fact. WHO defines low birth weight (LBW) as birth weight less than 2500 g. The definition of LBW does not take into account the gestational period (Ojha and Malla, 2007). In 2013, nearly 22 million newborns—an estimated 16 per cent of all babies born globally that year—had low birth weight (UNICEF, 2016). Birth weight plays an important role in infant mortality and morbidity development, and future health of the child (Godfrey and Barker, 2000). Low birth weight (LBW) is a significant risk factor for adverse health outcomes including many childhood diseases. The associations between LBW and a greatly elevated risk of infant mortality and other physical and neurologic impairments are well established. Thus, prevention of LBW is a major public health priority (Tabrizi and Saraswathi 2012).

Assessment of maternal nutritional status relies on measures of stature, pre-pregnancy weight (PPW), height, weight gain at different trimesters, weight gain during pregnancy. Maternal weight (WT), height (HT) and pregnancy weight gain have all been shown to be significant predictors of birth weight (Nahar *et al.*, 2007). Numerous research projects have studied maternal anthropometric indicators as predictors of birth weight (Ugwa, 2014, Neumann

*et al.*, 1995; Mathews *et al.*, 2004; Tabrizi and Saraswathi 2012). Hence an attempt was made to study the relationship of maternal anthropometric measurements with birth weight of neonates.

### Materials and Methods

The present study comprised of a total 215 pregnant women in their last trimester who were selected from Government Hospitals of Nagpur City. A structured questionnaire was developed which consisted of questions related to demographic and socioeconomic profile and anthropometric measurements. Interview cum questionnaire method was used for eliciting information. The maternal anthropometry viz., height, weight and mid arm circumference were recorded as per standard methods (Jelliffe, 1966). The birth weight was noted from the hospital records. The data obtained were analyzed using percentages, means and standard deviations. Correlations were computed using Pearson's Product moment Coefficients. The data thus collected was analyzed statistically and results were interpreted accordingly.

### Results and Discussion

#### Socio-demographic Profile

The socio demographic profile of the mothers showed that the majority pregnant women (55.35%) were in the age group of 20-25 years. The mean age of women was found to be  $24.43 \pm 3.24$  years. About 40.47% belonged to nuclear family. 58.14% and 17.21% pregnant women had education up to SSC and HSSC respectively. The mean monthly per capita income of pregnant women was Rs.  $678.60 \pm 554.25$ .

### Mean Maternal Anthropometric Measurements

The mean anthropometric measurements of pregnant women have been presented in Table 1. The mean height of mother was found to be 154.07 cm. Garg and Kashyap, 2006 also reported the mean heights of pregnant women as  $154.33 \pm 3.95$  cm and  $153.47 \pm 4.11$  cm, respectively for middle and late gestation groups. Rao *et al*, Yajnik *et al*, (2003) and Tabrizi and Saraswathi (2012) reported the mean height of pregnant mothers as 154.2 cm, 152 cm and 159.1 cm respectively.

In the present study, the mean pre-pregnancy weight of pregnant women was found to be  $46.82 \pm 5.30$  kg and the mean weight of pregnant women during the last trimester was  $54.74 \pm 6.08$  kg. The mean gain in weight of pregnant women was  $7.92 \pm 2.21$  kg. Rao *et al*. (2001) reported the mean weight gain during pregnancy as 8.0 kg (SD=2.6) whereas Tabrizi and Saraswathi (2012) reported mean weight gain during pregnancy as 11.8 kg.

The mean MUAC of mothers of the present study was  $22.07 \pm 1.78$  cm. According to Paul and Puroshothaman, (2002) the mid arm circumference below 20 cm can be taken as a sure sign of under nutrition and a cut off value of 20 cm can be used to identify pregnant women who need dietary intervention.

The mean BMI (kg/m<sup>2</sup>) of mothers of present study was  $19.75 \pm 2.00$  kg/m<sup>2</sup> respectively. According to Shobeiri and Begum, (2005) the mean BMI of pregnant women in middle and high income group was  $21.3 \pm 2.3$  and  $21.4 \pm 3.8$  (kg/m<sup>2</sup>) respectively.

### Birth Weight of Newborn

Birth weight is a reliable and sensitive predictor of a newborn's chances for survival, growth and long term physical and psychosocial development (Biswas *et al.*, 2008). In the present study the birth weight of newborns ranged between 1.2 to 3.7 kg. Majority of neonates (46.51%) weighed between 2.5 to 3.0 kg whereas only 15.35% weighed more than 3 kg. The mean birth weight of newborn was found to be  $2.51 \pm 0.43$  kg. (Table 2)

### Maternal Anthropometry and Birth weight of Neonates

The maternal anthropometry and birth weight of neonates has been presented in Table 3. Results of the study showed that the maternal height had positive and significant correlations ( $r = 0.232$ ,  $p < 0.01$ ) with birth weight of infants. Rao *et al.*, (2001), Parvathi and Begum, 2007 and Kanade *et al.*, 2008 also reported a statistically significant correlation between maternal height and birth weight ( $p < 0.01$ ).

In the present study, pre-pregnancy weight ( $r = 0.342$ ,  $p < 0.01$ ) showed a positive and significant correlations with birth weight of infants. A statistically significant correlation has also been observed between pre-pregnancy weight ( $r = 0.4$ ,  $p < 0.01$ ) and birth weight by Rao *et al.*, (2001) and by Kanade *et al.*, 2008 ( $r = 0.2259$ ;  $p < 0.01$ ).

In the present investigation, the maternal last trimester weight ( $r = 0.454$ ,  $p < 0.01$ ) showed a positive and significant correlations with birth weight of infants. Nerlekar *et al.*, 1999 also reported the weight (kg) of infants was positively correlated only with maternal weight. Maternal weight showed a strong positive correlation with birth weight ( $r=0.48$ ) and was statistically significant ( $p < 0.001$ ) (Ugwa, 2014).

The gain in weight of mothers of the present study, showed a positive and significant correlations with birth weight of infants ( $r = 0.427$ ,  $p < 0.01$ ). Similarly, Rao *et al* (2001) and Paul and Puroshothaman (2002) also observed a significant correlations between weight gain during pregnancy and birth weight.

The maternal mid upper arm circumference of mothers of the present study showed positive and significant correlations with birth weight of infants ( $r = 0.471$ ,  $p < 0.01$ ). According to Paul and Puroshothaman (2002) MUAC was positively correlated with birth weight.

The maternal Body Mass Index of mothers of the present study had positive and significant correlations with birth weight of infants ( $r = 0.246$ ,  $p < 0.01$ ). According to Ugwa (2014), maternal BMI showed a weak positive correlation with birth weight ( $r=0.28$  and was statistically significant ( $p < 0.001$ ).

**Table 1:** Mean Maternal Anthropometric Measurements of Pregnant Women (N = 215)

SN	Maternal Anthropometric Measurements	Pregnant Women Mean $\pm$ SD
1	Height (cm)	$154.07 \pm 4.55$
2	Pre-pregnancy Weight (kg)	$46.82 \pm 5.30$
3	Last Trimester Weight (kg)	$54.74 \pm 6.08$
4	Gain in Weight (kg)	$7.92 \pm 2.21$
5	Mid Upper arm Circumference (cm)	$22.07 \pm 1.78$
6	Body Mass Index (kg/m <sup>2</sup> )	$19.75 \pm 2.00$

**Table 2:** Distribution of Newborns According to Birth Weight (N = 215)

Sr. No.	Birth Weight (kg) Categories	Number of New born	Mean $\pm$ SD Birth weight
1	< 2	19 (8.84)	1.65 $\pm$ 0.21
2	2-2.5	63 (29.30)	2.25 $\pm$ 0.15
3	2.5-3	100 (46.51)	2.62 $\pm$ 0.13
4	>=3	33 (15.35)	3.18 $\pm$ 0.21
Overall Mean $\pm$ SD			2.51 $\pm$ 0.43

**Table3 :-**Correlation Coefficient Between Maternal Anthropometry and Birth weight of Neonates

SN	Maternal Anthropometry	Birth Weight (BW) (kg)
1	Height (cm)	0.232**
2	Pre-pregnancy Weight (kg)	0.342**
3	Last Trimester Weight (kg)	0.454**
4	Gain in Weight (kg)	0.427**
5	Mid Upper arm Circumference (cm)	0.471**
6	Body Mass Index (kg/m <sup>2</sup> )	0.246**

\* p < (0.05), \*\* p < (0.01)

**Conclusion:**

The present study was carried out to assess the relationship between maternal anthropometry and birth weight of infants. It can be concluded from the study that the initial weight, weight in last trimester, gain in weight, mid upper arm circumference (MUAC) and BMI of GMH mothers are positively and significantly correlated with birth weight of neonates. So, nutritional status of the mother before pregnancy and during pregnancy must be kept adequate to get healthy babies.

**References:**

- Biswas, R., Dasgupta, A., Sinha, R. N. and Chaudhuri, R. N. (2008): 'An epidemiological study of low birth weight newborns in the District of Puruliya, West Bengal.' *Indian J Public Health*, 52 (2) : Pp.65-71.
- Garg, A. and Kashyap, S. (2006): 'Effect of counseling on nutritional status during pregnancy'. *Indian J Pediatr*, 73 (8) : Pp. 687-692.
- Godfrey K M, Barker DJ (2000): Fetal nutrition and adult disease. *Am J Clin Nutr*. 71: Pp. 1344s-1352S.
- <https://data.unicef.org/topic/nutrition/low-birthweight/>
- Jelliffe, D.B. (1966): *The Assessment of the nutritional status of community (with special reference to field surveys in developing regions of the world*. World Health Organization Geneva.
- Kanade, A.N., Rao, S., Kelkar, R.S. and Gupte, S. (2008): 'Maternal Nutrition and birth size among urban affluent and rural women in India'. *Journal of the American College of Nutrition* 27 (1) : Pp. 137-145 <<http://www.jacn.org/cgi/content/>> [Accessed 13 February 2010].
- Mathews F, Youngman L, Neil A. (2004): Maternal circulating nutrient concentrations in pregnancy: implications for birth and placental weights of term infants. *Am J Clin Nutr*.;79: Pp. 103-110. [PubMed].
- Neuman, c., Ferguson, L and Bwibo, N.O. (1995): Maternal anthropometry as a risk predictor of pregnancy outcome: the nutrition CRSP in Kenya. *WHO Bulletin*, suppl. 73 Pp. 91-95.
- Nerlekar, J.P., Nalwade, V.M. and Reddy, N.S. (1999): 'Effect of maternal factors an outcome of pregnancy'. *Ind. J. Nutr.Dietet*. 36 Pp. 320-323.
- Nahar, S. M., Taylor. C. G. N., and Begum, H. A. (2007): 'Maternal anthropometry as a predictor of birth weight'. *Public Health Nutrition*, 10 (7) : Pp .965-970.
- Ojha, N. and Malla, D.S. (2007): Low birth weight at term: relationship with maternal anthropometry. *J Nepal Med. Assoc.* 46(2) Pp. 52-56.
- Paul, M. and Purushothaman V. (2002): 'Birth weight in relation to maternal anthropometric indices'. *Indi. J. Nutr. Dietet*, 39 (6) Pp. 257-261
- Parvathi, M. and Begum, K. (2007): 'Dietary intakes, anthropometric measurements and pregnancy outcome among women from low income families'. *The Ind. J. Nutr.Dietet*, 44 (10) : Pp. 484-491.
- Rao, P. R. S., Prakash, K.P. and Nair. N. S. (2001): 'Influence of pre-pregnancy weight, maternal height and weight gain during pregnancy on birth weight'. *Bahrain Medical bulletin*, 23(1) Pp. 22- 26.
- Sharma, K., Prakash, A. and Kohli, R. (2001): 'Study of maternal anthropometry and pregnancy outcomes'. *J. of Obst. and Gyn. of India*, 51(3) Pp. 99-100.
- Shobeiri, F. and Begum, K. (2005): 'Assessment of energy balance among Indian women during pregnancy'. *The Ind. J. Nutr.Dietet*. 42 (9) Pp. 223-229.
- Tabriz, F and Saraswati, G (2012) :Maternal Anthropometric measurements and other factors: relation with birth weight of neonates. *Nutr Research Pract.* 6(2) Pp.132-137.
- Ugwa, S. (2014) Maternal Anthropometric characteristics as determinants of birth weight in North-West Nigeria: A prospective study *Niger J Basic Clin Sci* 1 (1) Pp. 8-12.
- Yajnik, C.S., Fall, C.H., Coyaji, K.J., Hirve, S.S., Rao, S., Barker D.J.P., Joglekar, C. and Kellingray. S. (2003): Neonatal anthropometry : the thin fat Indian baby. The Pune maternal nutrition study'. *International Journal of Obesity* 27: (2) Pp. 173-180.