THE EFFECT OF MATERNAL AGE, GESTATIONAL AGE AND PARITY ON THE SIZE OF THE NEWBORN

H. Shajari[1], V. Marsoosy[2], M. Aslani[1], M. R. Mohammady[1] and P. Heshmaty[2]

1) Department of Neonatology, Shariati Hospital, School of Medicine, Medical Sciences/ University of Tehran, Tehran, Iran

2) Department of Obstetrics/Gynecology, Shariati Hospital, School of Medicine, Medical Sciences/University of Tehran, Tehran, Iran

Abstract- A descriptive prospective study was undertaken to determine birth weight, length and head circumference of live births and to examine the effect of maternal age, parity and gestational age on birth sizes of the live births. A total of 459 term singleton maternal– neonate pairs were studied. The neonates had anthropometric measurements determined with in 24hours of life using standard methods. There were 247 (53.8%) males and 212 (46.2%) females. The mean birth weight was 3123.75 ± 492.04, ranging between 1700-4550 gr. The incidence of low birth weight of the newborns was significantly higher for females ($P < 0.05$), younger maternal age ($P = 0.007$), primiparas ($P = 0.001$) and pre-term babies ($P < 0.001$). On the multivariate analysis, gestational age and sex of the newborn respectively had significant effects on birth weight, length and head circumference of the neonates controlling for the other variables. On the other hand parity and maternal age had significant effects only on the birth weight of the neonates. This study has provided information of the effects of some of maternal characteristics on the size, particularly length and head circumferences be given importance for monitoring and evaluating maternal and child health programs.

Acta Medica Iranica, 44(6): 400-404; 2006

INTRODUCTION

The term anthropometric refers to comparative measurements of the human body. The anthropometric measurements commonly used as indices of growth and development for infants include length, weight, and head circumference. Typically, growth is evaluated by comparing individual measurements to reference standards, represented by percentile curves on a growth grid (1, 2). Based on several studies, anthropometric measurements provide quantitative values for qualitative descriptions (3-12). Previous reports have determined a more complete understanding of the relationship between maternal characteristics, infant sex, and neonatal anthropometric measurements (13-15). Therefore, in this 6 month prospective study we assessed birth weight, length and head circumference of live births at Shariati Hospital, Tehran, Iran and examined the effects of maternal age, parity and gestational age to them.

MATERIALS AND METHODS

Population: data were obtained from 459 infants (247 males and 212 females), born in the Shariati Hospital, Tehran, Iran between October 2003 and March 2004. The following information were included in the questionnaire, age of the mother, parity, gestational age, sex, weight, length, head

circumference of the neonate and delivery type. Infants of minority ethnic groups were not considered. We also excluded newborns with major congenital chromosomal or metabolic abnormalities, gestational diabetes or other alterations that could affect body composition. Weight (g) was measured just after birth. The naked infants were weighed to the nearest 1o gm on Seca infant scale.

The scale was checked periodically. The length (cm) and head circumference (cm) were obtained within the first 24 hours of life by the same person.

The maximum occipitofrontal head circumference was measured to the nearest 0.1cm with non-stretch tape. Infant length was measured to the nearest 1cm. Term refers to infants between 37-42 weeks. Low birth weight refers to infants less than 2500 gm. Gestational age was expressed in complete weeks from the last menstrual period. Parity was determined taking in to consideration all the number of previous pregnancies resulting in either live births or still births after 28 weeks of gestational age.

Student's *t* test was used to compare different between mean values. Multiple linear regressions was used to determine the effects of maternal age, parity and gestational age on the size of the newborns. A *P* value of less than 0.05 was considered to be statistically significant.

RESULTS

Among the 495 singletons, 459 live births were included because of the adequate information 57 multiple births were excluded from the analysis two hundred and forty seven (53.8%) were males and 212(46.2%) females. There were 133(29%) normal vaginal deliveries and 326(71%) cesarean sections.

The mean ± SD weight was 3123.75±492.04, ranging between 1700-4550gr (Fig.1). The incidence of low birth weight was 10.9 %. Their mean ± SD length was 50.48 ± 2.72cm, median 50 cm while their mean ± SD head circumference was 33.92±1.91cm, median 34. Table 1 shows that mean birth weight, length and head circumference were significantly lower for females than males. More than 15% of the females had low birth weight as compared to 8.1% of males.

Mean birth weight increased with maternal age. Babies of mothers younger than 20 years of age had the lowest mean birth weight (2975.40 ± 369.38). Birth weight of the neonates increased significantly ($P = 0.001$) with parity. Also as shown in table 1, the length and head circumference of the neonates increased significantly with maternal age, parity and gestational age.

Table 1. Effect of sex, maternal age, parity, gestational age on weight, length and head circumference of the neonates

| Factor	Number	Weight Mean (SD)	LBW (%)	Length Mean (SD)	Head Circumference Mean (SD)
Sex					
Male	247	3165.59 ± 500.66	8.1%	50.79 ± 2.13	34.17 ± 1.83
Female	212	3075±478.36	15%	50.12 ± 3.24	33.62 ± 1.96
		P < 0.05		*P* = 0.004	*P* = 0.001
Maternal Age					
< 20	63	2975.40 ± 369.38		48.1 ± 3.2	32.65 ± 1.36
≥ 20	396	3147.35 ± 505.20		48.7 ± 3.8	34.12 ± 1.90
		P = 0.007		*P* = 0.120	*P* < 0.001
Parity					
One	242	3028.51 ± 493.56		48.4 ± 3	33.73 ± 1.79
Multipara	217	3229.95 ± 469.09		48.8 ± 3.2	34.12 ± 2.01
		P = 0.001		*P* < 0.05	*P* < 0.05
Gestational Age					
Preterm	14	2546.43 ± 588.83		48.14 ± 2.71	31.71 ± 2.64
Term	441	3138.78 ± 477.53		50.55 ± 2.69	33.97 ± 1.84
Post term	4	3487.50 ± 497.28		50.55 ± 2.69	35.5 ± 1.73
		P < 0.001		*P* = 0.001	*P* < 0.001
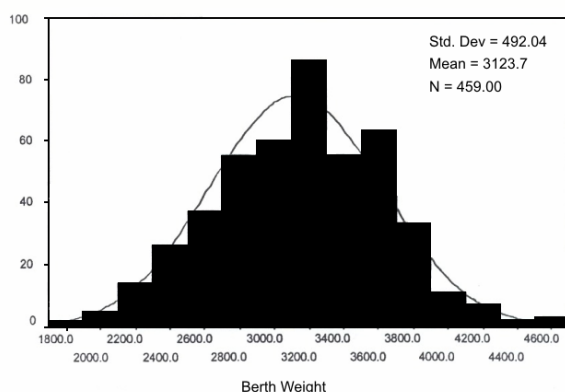
Fig.1. Birth weight of newborns. The mean ± SD weight was 3123.75±492.04, ranging between 1700-4550 gr.

DISCUSSION

Anthropometric data on neonate provide useful information and at any given time indicated the development status of the child (1-10, 16-20). Birth weight is recognized as a reliable indicator of intrauterine growth and one of the major factor determining child survival and future growth (1-20). In assessing and monitoring the nutritional status of a low birth weight infant. It is helpful to evaluate a pattern of measurements obtained on regular basis overtime. Different studies have reported the distribution of birth weight for Iranian babies ranging from 3123.75 to 492.04 and low birth weight rate of 8.1% -15% (21-23). The mean length of Iranian infant was higher by 5cm (50.48 ± 2.72) as compared to Saudi and Ethiopian infants 49.5 ± 2.0cm, 48.6 ± 3.3, respectively (5, 7, 9, 12).
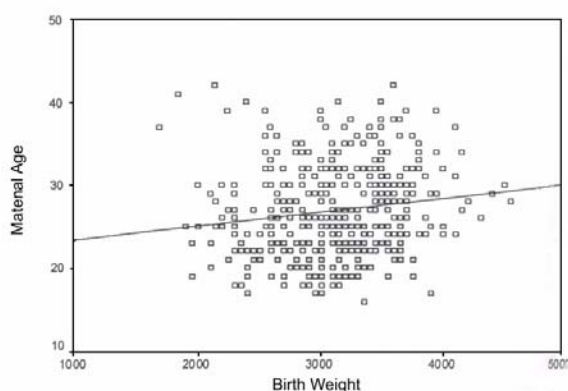

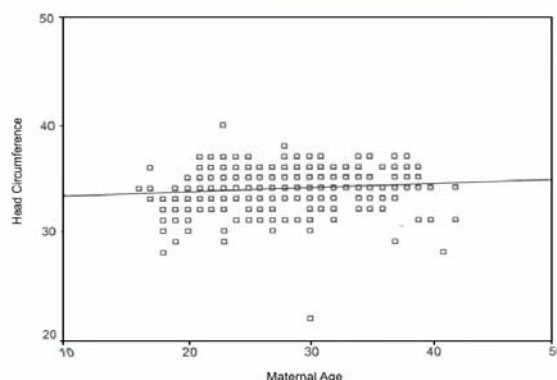**Fig. 2.** Relation ship between maternal age and birth weight of newborn.

Fig. 3. Relationship between maternal age and head circumference of newborn.

The head circumference of Iranian infants was lower (33.92 ± 1.91) versus Saudi (34.5 ± 1.5), Ethiopia (34.4 ± 2.9cm). As in other birth weight studies in Iran, the mean birth weight for male babies was found to be higher than that of the female babies and females has significantly higher incidence of low birth weight (21-23).

Our study showed that babies born of mothers aged 20 years and below had birth weight of 100g-300g lower than those mothers older than 20 years.

Similarly, the low birth weight rate is significantly higher in this age group. When the other variables are controlled in the multivariate analysis, the effect of maternal age on birth weight and head circumference is statistically significant (Fig. 2, 3). Data from some reports are in agreement with these findings (13-15).

Many studies have shown the impact of parity on birth weight (13-15) and the same was observed in this study. Mean birth weight was considerably lower for primigravidae and the proportion of low birth weight correspondingly higher.

This could be explained by the fact that there is a general agreement that pregnancy outcomes are more favorable for multiparae than primiparae.

The major determinant of birth weight in this study was gestational age. Gestational age was found to be a strong, independent predictor of birth weight. The mean birth weight increased on average by 50g per week after controlling for maternal age, parity and sex of baby similar to many studies. In conclusion, this study has provided information on the effects of some of maternal characteristics on the

size particularly length and head circumference of newborns which were not given emphasis on previous birth weight studies. It is suggested that birth weight, length and head circumference be given importance as essential indicators for monitoring and evaluating maternal and child health programs.

Conflict of interests

The authors declare that they have no competing interests.

REFERENCES

1. [No authors listed]. Physical status: the use and interpretation of anthropometry. Report of a WHO Expert Committee. World Health Organ Tech Rep Ser. 1995; 854:1-452.

2. Harrison D, Harker H, Heese HD, Mann MD, Berelowitz J. Errors in anthropometric measurements in neonates and infants. Curationis. 2001 May; 24(2):23-27.

3. Needleman RD. Growth and development. In: Behrman RE, Kliegman RM, Jason HB, editors. Nelson textbook of pediatrics. 17th ed. Philadelphia: Saunders; 2004. p. 23-67.

4. Ramankutty P, Tikreeti RA, Rasaam KW, Al-Thamery DM, Yacoub AA, Mahmood DA. A study on birth weight of Iraqi children. J Trop Pediatr. 1983 Feb; 29(1):5-10.

5. Hofvander YA. A survey of 3000 children examined at the "mobile child health center" in Addis Ababa in 1962. Ethiop Med J. 1963; 1: 156.

6. Young PN. Birth weights of hospital –delivered infants in Addis Ababa and Gondar. Ethiop Med J. 1968; 6:15.

7. Zein A, Gebre- Kidan K, Eshete N, Haile N, et al. Birth weight of hospital delivered neonates in gondar, North western Ethiopia. Ethiop Med J. 1985; 23: 59-63.

8. Green-Abate C. Changes in birthweight distribution from 1973 to 1982 in Addis Ababa. Bull World Health Organ. 1986; 64(5):711-714.

9. Nadebo TA. Two year retrospective study of birth weight in Sidamo Regional Hospital. Ethiop Med J. 1990; 32: 255-257.

10. Paine PA, Pasquali L, Joaquim MC. Effects of birthweight and gestational age upon growth in Brazilian infants: a longitudinal study. J Trop Pediatr. 1983 Feb; 29(1):11-17.

11. Dimitrov I. Accelerative changes in some anthropometric indices of newborn infants in Plovdiv during the period from 1939 to 1995. Folia Med (Plovdiv). 1997; 39(1):80-84.

12. Serenius F, Edressee AW, Swailem AR. Size at birth of infants in a Saudi maternity hospital. Acta Paediatr Scand Suppl. 1988; 346:44-56.

13. Rondo PH, Tomkins AM. Maternal and neonatal anthropometry. Ann Trop Paediatr. 1999 Dec; 19(4):349-356.

14. Raud J, Kaarma H, Hoskel S. Using mothers and newborns' clinical anthropometric data to analyze birth histories. J Gymea Polska. 1998; 69(8):628-637.

15. Goldenberg RL, Cliver SP, Neggers Y, Copper RL, DuBard MD, Davis RO, Hoffman HJ. The relationship between maternal characteristics and fetal and neonatal anthropometric measurements in women delivering at term: a summary. Acta Obstet Gynecol Scand Suppl. 1997; 165:8-13.

16. Bhat GJ, Mukelabai K, Shastri GN, Tamina C. Anthropometric parameters of Zambian infants at birth. J Trop Pediatr. 1989 Jun; 35(3):100-104.

17. Britton JR, Britton HL, Jennett R, Gaines J, Daily WJ. Weight, length, head and chest circumference at birth in Phoenix, Arizona. J Reprod Med. 1993 Mar; 38(3):215-222.

18. Ivanov VP, Churnosov MI, Kirilenko AI. [Population-demographic structure of the population of Kursk region: anthropometric profile of newborn children] Genetika. 1998 Dec; 34(12):1692-1698. Russian.

19. Singh N, Gupta R. Anthropometric data in term newborns. Indian Pediatr. 1994 Apr; 31(4):466-467.

20. Naik DB, Kulkarni AP, Aswar NR. Birth weight and anthropometry of newborns. Indian J Pediatr. 2003 Feb; 70(2):145-146.

21. Koosha A. Weight, length, head circumference birth in Zanjan, Iran. The Journal of Zanjan University of Medical Sciences and Health Services. 1997; 18: 16-15.

22. Golalipour MG, et al. The relationship between maternal characteristics and neonatal anthropometric measurements. The Journal of Qazvin University of Medical Sciences & Health Services. 2000; 16: 58-64.

23. Golalipour MG, et al. Birth weight and length of Multipara women delivered infants in Gorgan, Iran. The Journal of Babol University of Medical Sciences & Health Services. 1999; 3:18-23.