

Seasonal Variations of Heights, Weights and Head Circumferences of Full term Newborns in Hamadan City, Iran

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Abstract

Backgrounds: A number of studies have focused on the effects of season of birth, as an environmental factor, on embryonic development.

Methods: In a retrospective descriptive work, heights (crown to heel), weights and head circumferences of the full term, normal, and singleton newborn infants in Hamadan City (west of Iran) were collected from their randomly selected files in Fattemieh Hospital during five consecutive years (1998-2002). The studied files were 1800 cases, about 15% of total live births in the hospital during the considered period. We statistically compared the above parameters in four seasons.

Results: Seasonal variation of mean birth weight and mean birth height were not statistically different. However, mean head circumference showed a peak in winter and a decline in autumn with statistical significant ($P<0.005$).

Conclusion: We can conclude that season of birth can be considered as one of the environmental factors that affect on embryonic development.

Keywords: *Body height, birth size, body weight, head circumference, new born*

Introduction

In dealing with biological systems, such as those that determine the rates of growth and development, it is important to keep in mind the concept of biological variation (1). The normal variation can be demonstrated by recording the physical measurements of a large group of apparently normal individuals who are of exactly the same age and normal newborns in this case. It becomes immediately obvious that there are wide variations in their sizes. Factors that affect the birth weight, height and head circumference are mainly the duration of gestation, mother nutrition and life style, multiple pregnancy, health situation of the mother and parental ge-

netic materials. In addition, we see "unknown factors" in the texts and literatures (1).

The most dramatic events in growth and development occur before birth. These changes are overwhelmingly somatic: the transformation of a single cell into an infant. The uterus, although offering a degree of protection, is permeable to social, psychological and environmental influences (2).

Seasonal variations of birth sizes, especially mean birth weight (MBW), have been interested for a series of researches during the last decade (3-6). In some studies, it is stated that seasonality of MBW is related to the seasonality of the gestation time (3).

The goal of the present work was to study the seasonal variations of height (crown to heel),

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weights and head circumferences of a large group of full term and normal newborn infants in a university hospital in Hamadan City from 1998 to 2002.

Materials and Methods

The present study was a cross-sectional descriptive study. Our statistical population was all normal and full term newborn infants that were born in Fattemieh Hospital, in Hamadan City during a period of 5 yr (1998-2002).

The external criteria were: a) infants with an apparent congenital malformation, b) infants with mothers aged below 25 and over 35 yr, c) infants with diabetic mothers, d) infants with smoker mothers, e) infants with mothers affected to a chronic disease, f) infants with gestation age lower than 38 or over 42 wk and finally g) multiple pregnancies.

All infants that were born during considered period in Fattemieh Hospital were 11700 cases. We employed the suitable formula for determination of the sample size. With $p=40\%$, $d=0.03$ and $Alfa=0.01$, the sample needed was 1800 infants. We randomly selected 30 files from each month (about 15% of new born infants). The files that had one or more excluded criteria were omitted and their next numbers were selected. Necessary information obtained from the files was gathered in suitable questionnaires. First we estimated the effect of birth orders, mother ages and gestation ages (in our

considered ranges) on seasonality. When we found out that they were not significantly effective, we statistically compared the mean of considered parameters (height, weight and head circumference) as to different seasons. We employed SPSS version 11 software, *t*-test and ANOVA for our comparisons.

Results

Seasonal variations of birth orders, mother ages and gestation ages among our population are shown in Table I. Also Table II Shows Mean rates of height, head circumference, and weight of full term and normal newborn infants according to their season of births during a 5-yr period (1998-2002) in Fattemieh Hospital. Results of comparison of the means between those three parameters have shown that they were not significantly different.

Mean of height (crown to heel) was 49.77 cm in summer births and fall births as well, 49.66 cm in spring births and 49.48 cm in winter births. These rates were not statistically different.

Mean birth weight (MWB) among different season birth were as follows: 3214.78 g in winter, 3247.1 g in summer, 3258.07 g in fall and 3286.8 g in spring. Their differences were not statistically different.

Mean of head circumferences in winter (35.25) and fall (34.87) was significantly different ($P<0.005$).

Table I: Birth orders, mother ages and gestation ages of full term and normal newborn infants according to their season of births during a 5-yr period (1998-2002) in Fattemieh Hospital.

Season of Birth	Birth Order		Mother Age (year)		Gestation Age (week)	
	Mean	SD	Mean	SD	Mean	SD
Spring	2.26	0.054	27.76	3.06	39.68	1.12
Summer	2.28	0.063	27.5	3	39.63	1.13
Full	2.41	0.061	27.93	3.2	39.58	1.07
Winter	2.33	0.057	27.61	2.98	39.5	1.2
Total	2.32	0.03	27.71	3.06	39.6	1.13
F	1.33		1.6		2	

<i>P</i> value	0.26	0.17	0.1
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Table II: Mean rates of height, head circumference, and weight of full term and normal newborn infants according to their season of births during a 5-yr period (1998-2002) in Fattemieh Hospital

Season of Birth	No.	Height (cm) crown to heel		Head circum-ference (cm)		Weight (g)	
		Mean	SD	Mean	SD	Mean	SD
Spring	450	49.46	2.21	35.16	1.33	3286.8	422.57
Summer	450	49.77	2.36	34.96	1.42	3247.1	390.61
Full	450	49.77	2.21	34.87	1.33	3258.07	409.99
Winter	450	49.48	2.42	35.25	1.95	3214.78	402.41
Total	1800	49.66	2.3	35.06	1.53	3251.69	407.04
F		1.41		5.9		2.4	
<i>P</i> value*		0.235		0.001		0.055	

* Anova test 3

Discussion

It seemed that parameters such as birth order mother age and gestation age would play a bias role and would affect the results. Thus, at first we examined their distribution among four seasons. As it is shown in Table I, their differences in different seasons were not statistically different. It means that the distributions of different levels of those three parameters were almost similar among all four seasons.

MWB in Hamadan was 3030 g for male births and 2920 for female births in 1989 (7). Based on our results, the same rates were 3311.48 and 3191.63, respectively. Such differences can be consequences of two things: first, improving of health services for pregnant mothers and second, recent work included just full term and normal infants, while the former work included all new born infants.

Table II shows the MBW in four seasons. As the results show, the rates are different, but they are not statistically significant. Matsuda and colleagues (3) analyzed the seasonal variations in mean birth weight and mean gestation period of 47 prefectures in Japan. They showed that there is a seasonal rhythm of MGP. Generally MGP showed a deep trough in winter and a shallow one in summer to early autumn. They noted that that pattern was similar to that of

MBW. Matsuda and colleagues in another work (8) reported that seasonal patterns of mean birth weight showed two peaks in May, October-November, two troughs in June-September and February-March, and a deep trough in winter and a much smaller one in June-September. We think at least one part of their work is adopted with our results. It means that in our case population the MBW was seasonality variable. We did not work on its etiology, but Matsuda and colleagues stated that probably seasonality in MGP is the reason of seasonality in MBW. More works with larger population will bring in light the real etiology of mean birth weight seasonality.

Geenfield (9) studied the birth weights in hospitals of two regions. He stated that birth weights varied with sex, region of maternal origin, season and birth order, but not with year. In his work, male infants had a bigger MBW in comparison of the female infants; his result was adopted with ours. Geenfield showed that a higher proportion of large infants were born after the rainy season and the harvest season than at other times. In another work in Nigeria, Lawovin (10) in a prospective study analyzed the data on a total of 492 randomly selected women who delivered at term singleton babies in the facilities. He stated that maternal weight gain, maternal height, season of delivery and

maternal Ponderal index at delivery were significantly related.

Results showed that the differences between mean head circumferences (MHC) in four seasons were significant ($P < 0.005$). Table II shows the highest rate in winter and the lowest in spring. MHC was 34.48 cm in female births and 35.32 cm in male births, in the present work. The same parameter was 34.73 cm and 35.24 cm, respectively in a work in the same region in 1989 (7). We could not find any references about seasonal variation of MHC to compare with our results. Based on the fact that this parameter is related to brain development, it is necessary to work more on such topics in larger populations in different regions.

Birth height is another important parameter of new born babies. It has a clinical meaning too. In the present work, mean birth height (MBH), crown to heel, was 49.92 and 49.40 cm in male births and female births, respectively. The same parameter in another work in the same region in 1989 (7) was 48.20 and 47.5 cm in male births and female births, respectively. Table II shows seasonal variation of MBH. As we can see, the lowest rate was in spring and the highest in summer and fall, but the differences was not significant.

Finally we can conclude that season of birth can be considered as one of the environmental factors that affect on embryonic development and can be considered in family planning.

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