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BIRTH DATA OF PATIENTS WITH DOWN SYNDROME

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Abstract: Gestation weeks and three body measurements of newborn patients with Down syndrome were recorded. The mean of these data including the gestation weeks were significantly less than that of the control. 62.8% of the patients were born at time, 20% of them had less birthweight than 2500 g.

Introduction

Body measurements of the newborn with Down's syndrome have been poorly studied, and their fetal development is prospectively irregular because of the frequency of developmental disorders:

According to several reports the measurements of the newborn with Down's syndrome are nearly normal. No significant differences were found in Downs' and Controls' birth weight by Southwick (1939). Comparing the size at birth of 563 newborns with Down's syndrome, who were born between the 28th and 44th weeks of gestation, Kucera (1971) did not describe significant differences.

Smith and McKeown (1955) did not find differences in the birth weight of control or Down's syndrome subjects, who were born between the 30th and 38th weeks of gestation. Those who were born between the 38th and 45th week had lighter weight. The mean gestation period of Down's syndrome subjects was 268.9 days, lower than that of the control (278.4 days). The authors suggested that the low birth weight of Down's syndrome subjects resulted not only from the shorter gestation period but also from the low rate of growth in intrauterine life.

Hall (1964) also described shorter gestation periods in Down's syndrome newborns (176.5 days) than that of the controls (282.8 days).

Most of the publications described considerable differences in the size at birth between the Down's syndrome and „normal", newborn babies. Katz and Taylor (1967) found that two thirds of Down's syndrome subjects had a birth weight under 2500 g. According to other authors the average birth weight of Down's syndrome newborns is about 3 kgs, considerably less than that of the controls (Smith and McKeown 1955, Chen et al. 1970).

Using linear regression analysis Pueschel et al. (1976) reported significantly lower birthweights of Down's syndrome subjects than that of their siblings. The mean recumbent length at birth in Down's syndrome patients was reduced by 0.5 SD from the mean of the control study (Cronk 1978).

Material and Methods

Birth length, weight, head girth and length of the gestation period of 144 newborns with Down's syndrome (72 boys and 72 girls) were recorded. The gestational age was counted from conception so it is two weeks shorter than if it had been calculated from the last menstruation.

Body measurements of most of the patients were investigated over the first ten years of age. The connection between the body weight and height and the corresponding size at birth were analyzed by the multiple linear regression analysis.

Results and Discussion

The Table 1 shows the means and standard deviations of our recorded data which are consistently lower than that of the Hungarian birth data. No significant sex differences were found in the Down's patients, so the data will be discussed together.

Table 1. Birth data of Down patients

Body measurements and gestation	boys		girls	
	$\bar{x}$	SD	$\bar{x}$	SD
Birth weight (gr)	2913	58.2	2934	54.8
Birth lenght (cm)	51.3	3.4	50.3	3.3
Head girth (cm)	32.4	1.5	32.7	1.7
Gestation (days)	254.1	2.6	254.8	2.5

Most of our patients were born in the 38th week (Table 2). This lenght of gestation period seems to be an optimum: lower sizes result either from shorter or longer periods.

Table 2. Birth data according to the gestation period

Gestation period	%	Birth weight	Birth lenght	Head girth
above	1.4	2800	50.5	–
38 weeks	61.8	3139	48.8	33.1
under	36.8	2556	46.2	32.3

Patients were also grouped according to their birth weight (Table 3). Only one fifth of them had less birth weight then 2500 g. Both the gestation period and the sizes are less in this group.

Table 3. Birth data according to the birth weight

Birth weight	%	Gestation weeks	Birth lenght	Head girth
at or above 2500 gr	79.2	36.9	51.9	33.1
under	20.8	34.4	46.5	31.9

The correlation coefficients among the recorded data were also calculated (Table 4). We found significant correlations between all data pairs.

Table 4. Correlation matrix of birth data

	Birth weight	Birth lenght	Head girth	Gestation period
Birth weight	=======			
Birth lenght	.6985	=======		
Head girth	.5487	.5924	=======	
Gestation period	.4920	.3977	.3628	=======

Growth rate of the children with Down's syndrome after birth is less than that of the control. At this age, the mean of the recumbent length of Down's syndrome subjects was 2 SD below that for normal children. The mean weight reduction of that age was 1.5 SD (Cronk 1978).

We use the multiple linear regression analysis to investigate the influence of the birth data on the growth of height and weight, as mentioned above. The growth of these measurements is not completely linear so this model is not the best. This calculation was intended to be the first approximation of the problem.

In our calculation the appropriate body measurements were used as the dependent ones. The first independent variable was the age of the child and the second one was the corresponding data at birth.

If the independent variable is the body weight (Table 5) about 60% of its variation can be explained in this way. The significance of determination coefficients was computed by the F test. We also calculated the relative importance of the independent variables.

Table 5. Regression analysis of body weight

$$y = a + b_1 x_1 + b_2 x_2$$

1. Dependence of body weight (y) upon the age (x_1) and the birth weight (x_2)			
$y = 15.067 + 1.784\, x_1 + 0.135\, x_2$	$R^2 = 64.75\%$	$F = 34.90^{++}$	$\hat{b}_1/\hat{b}_2 = 21.88$
2. Dependence of body weight (y) upon the age (x_1) and the birth lenght (x_2)			
$y = -38.857 + 2.149\, x_1 + 0.979\, x_2$	$R^2 = 69.50\%$	$F = 31.91^{++}$	$\hat{b}_1/\hat{b}_2 = 4.11$
3. Dependence of body weight (y) upon the age (x_1) and the gestation weeks (x_2)			
$y = 4.107 + 0.0323\, x_1 + 0.344\, x_2$	$R^2 = 56.82\%$	$F = 25.00^{++}$	$\hat{b}_1/\hat{b}_2 = 15.14$

This method can explain the variance of body height (Table 6) about 50% only. Of course, the more important independent variable was the children's age. On the other hand, some influence of the birth data can be supported. This influence is perhaps a little more apparent in body weight than body height.

Table 6. Regression analysis of body height

$$y = a + b_1 x_1 + b_2 x_2$$

1. Dependence of body height (y) upon the age (x_1) and the birth lenght (x_2)			
$y = 77.980 + 2.082\, x_1 + 0.583\, x_2$	$R^2 = 45.39\%$	$F = 12.05^{++}$	$\hat{b}_1/\hat{b}_2 = 6.70$
2. Dependence of body height (y) upon the age (x_1) and the birth weight (x_2)			
$y = 98.021 + 2.010\, x_1 + 3.489\, x_2$	$R^2 = 45.05\%$	$F = 11.89^{++}$	$\hat{b}_1/\hat{b}_2 = 7.98$
3. Dependence of body height (y) upon the age (x_1) and the gestation weeks (x_2)			
$y = 23.761 + 0.0418\, x_1 + 2.260\, x_2$	$R^2 = 51.53\%$	$F = 15.42^{++}$	$\hat{b}_1/\hat{b}_2 = 2.63$

The influence of the recorded birth data itself at birth on the actual body size cannot be proven in this way (Table 7).

Table 7. Regression analysis of body weight and body height

1. Dependence of body weight (y) upon the birth weight (x_1) and birth lenght (x_2)		
$y = -17.396 + 7.934\, x_1 + 0.779\, x_2$	$R^2 = 7.58\%$	$F = 1.15^{-}$
2. Dependence of body weight (y) upon the birth weight (x_1) and gestation weeks (x_2)		
$y = 42.712 + 6.759\, x_1 + 0.576\, x_2$	$R^2 = 2.56\%$	$F = 6.53^{-}$
. Dependence of body height (y) upon the birth weight (x_1) and birth lenght (x_2)		
$y = 159.178 - 0.957\, x_1 + 8.542\, x_2$	$R^2 = 2.77\%$	$F = 0.41^{-}$
. Dependence of body height (y) upon the birth lenght (x_1) and gestation weeks (x_2)		
$y = 221.059 - 0.169\, x_1 - 2.103\, x_2$	$R^2 = 7.49\%$	$F = 1.13^{-}$

On the basis of this correlation matrix interactions between our data could be supposed. Perhaps if we consider the birth data as the 3rd independent variable, then an interaction could be proved.

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