DYNAMIC CHANGES OF SOME ANTHROPOMETRIC INDICES OF THE NEWBORN CHILDREN IN PLOVDIV FOR A PERIOD OF 70 YEARS (1939 – 2009)

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Abstract:

Introduction: The periodical tracking and comparison of the physical development indices give an idea of the dynamics of the acceleration and the efficiency of the social and medical events for a protection of maternity.

Aim: Tracing the accelerative changes of the newborn Bulgarian children for 70 years.

Materials and methodology: The study is retrospective longitudinal research and includes the period 1939 – 2009. The initial information of the last survey was obtained at the Clinic of Obstetrics and Gynaecology at University Hospital St George – Plovdiv for the period 1 Jan 2009 – 31 Dec 2009. For the statistical processing is used variation analysis.

Results and discussion: The dynamic changes of two anthropometric indices are traced – height and body mass. There are two periods in the survey. The first, a 46-year period, is characterized by an apparent increase in the values of the two indices until 1975, inclusive, after which the acceleration rate gradually slows down. During the second ten-year period, 1985 – 1995, there is a sharp decrease in the height and the body mass of the newborns, as their values are back to the level of 1946-47. The authors relate this negative tendency with the economic situation in the country, with the progressive impoverishment of the population, with the unemployment and the uncertainty in the future. In the last period, 1995 – 2009, there is a slight increase in the values.

Conclusions: This survey is the most extended study of the physical development of the newborn children in Bulgaria. The accelerative changes in the basic indices for physical development start in the antenatal period. The social factors are the basis for acceleration.

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Key Words: acceleration, new-born, body mass, height, dynamic changes.

Introduction

The periodical tracking and comparison of the physical development indices give an idea of the dynamics of the acceleration and the efficiency of the social and medical events. The in-depth literature review made possible the registration of several longitudinal surveys of the basic physical development indices of the newborn children. The longest survey was conducted in the Soviet Union and includes a period of 45 years (Novikov, 1981), in Japan – 26 years (Kazny, 2004), again in Russia – 15 years (Tretyak et al., 2005) and in Greece – 20 years (Karanica, 1999).

The tracking of the core anthropometric indices – height and body mass, of the newborn children in Plovdiv, includes a period of 70 years – from 1939 until 2009. The first study was conducted by Todor Zahariev in 1939 (Zahariev, 1968), (Zahariev, 1969), followed by a number of studies by I. Dimitrov, including the period from 1975 to 1995 (Dimitrov & Cochev, 1981; Dimitrov, 1990; Dimitrov, 1997) and by D. Taneva (Taneva, 2008).

Essential for the science of the physical development is the studying of the causes and the forms of the accelerated physical and neuropsychic development of children (Zeltser, 1978; Vlastovskii, 1988; Koleva, 1985; Volkova, 1988).

The aim of this study is to monitor the accelerative changes of newborn Bulgarian children for 70 years.

Methodology. In its nature, the study is a retrospective longitudinal research. In the statistical processing are used variation analysis and analysis of the dynamic changes.

The initial information about the physical development of the newborn was obtained at the Clinic of Obstetrics and Gynaecology at University Hospital St George – Plovdiv, for the period 1 Jan 2009 – 31 Dec 2009. The study, like all previous studies, does not include the prematurely born and born within multiple pregnancies. The accepted criteria for fetus maturity are body mass 2 500 g and height 45 cm (Koleva, 1985).

Results and discussion. Historically, the study includes several periods. The first one started before the beginning of World War II and includes the first years after the war, characterized by economic

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crisis and a sharp decline in the standard of living. Economic stabilization represented the second period. The third period - the second half of the 80s and the first decade of the "democratic" transition, was associated with a sharp decline in the standard of living, irrational and inadequate feeding and with chronic psychoemotional stress. The last period – the first years of the 21st century was characterized by gradual improvement of the socioeconomic conditions in the country (Volkova, 1988).

The analysis of the data in Table 1 allows the tracking of the changes in the basic anthropometric indices influenced by the socioeconomic and psycho-emotional factors. The established changes in the height and the body mass in both genders of the newborns are in a certain dependency of the variations in the observed periods.

Table 1: Accelerative changes in the body mass and the height of the newborns in Plovdiv: 1939 – 2009

	Boys						Girls					
Year	Number	x	±	S $\bar{x}$	S $\bar{x}$	P	Number	x	±	S $\bar{x}$	S $\bar{x}$	P
Body Mass												
1939/40*	583	3373	±	17.24	430	-	530	3219	±	16.07	372	*
1944/45*	409	3284	±	19.25	409	<0.001	397	3147	±	18.89	396	<0.001
1946/47*	496	3376	±	19.15	436	<0.05	429	3237	±	20.27	428	<0.05
1965/66*	2282	3443	±	9.37	448	<0.001	2033	3319	±	9.11	411	<0.001
1975/76**	898	3472	±	15.42	462	<0.001	850	3335	±	14.27	416	<0.001
1985/86**	696	3567	±	15.68	416	<0.001	686	3364	±	15.29	401	<0.001
1995**	306	3222	±	22.69	397	<0.001	337	3242	±	20.68	380	<0.001
2009***	378	3397	±	20.53	399	<0.001	380	3302	±	18.72	365	<0.001
Height												
1939/40**	583	50.00	±	0.07	1.86	*	530	49.30	±	0.06	1.52	*
1944/45*	409	49.50	±	0.08	1.84	<0.001	397	49.00	±	0.08	1.71	<0.001
1946/47*	496	49.50	±	0.07	1.77	<0.05	429	49.30	±	0.08	1.88	<0.05
1965/66*	2282	50.20	±	0.03	1.60	<0.001	2033	49.70	±	0.03	1.54	<0.001
1975/76**	898	50.60	±	0.05	1.35	<0.001	850	50.10	±	0.04	1.23	<0.001
1985/86**	637	50.70	±	0.05	1.32	<0.001	698	50.20	±	0.05	1.26	<0.05
1995**	302	49.27	±	0.09	1.64	<0.001	337	49.30	±	0.08	1.56	<0.001
2009***	383	49.44	±	0.10	1.91	<0.001	393	48.83	±	0.09	1.81	<0.001

Source: Author

As was mentioned before, in the first period there are two sub-periods. The first one includes the first two studies of T. Zahariev (Zahariev, 1968; Zahariev, 1969). The difficult social status in the first year after WWII results in a statistically significant reduction of the height and the body mass of both sexes compared to the study 1939-40 - $0.01 > P < 0.001$ (body mass u = 3.49 (boys) and 2,90 (girls), and height u = 4.55 (boys) and u = 3.00 (girls)).

It takes only one year (1946-47) to bring the values of the monitored indices to the initial level ($P> 0.05$). According to many authors, the psycho-emotional factors have a significant role, which in this case is the peace (Novikov, 1981; Karanica, 1999; Zahariev, 1969; Koleva, 1985; Dimitrov, 1997).

Interesting is the comparison of the data from the survey of 1985-86, with the survey of T. Zahariev for 1944-45. In the 40-year period, noticeable accelerative changes have occurred: the body mass of the boys is bigger with 283 g and of the girls with 283 g. The height in both genders has increased with 1.2 cm. The differences are significant – $P < 0.001$ (body mass: boys u =11.65, girls u=5.99 and height: in

both genders 13.34). The positive accelerative changes in this 40-year period are a result of the stable socioeconomic status of the population, as well as the development of the healthcare system in the country, more specifically in the area of the maternity health care.

Impressive is the fact that the speed of the accelerative changes in this period is characterized by a tendency towards gradual slowing. Although the height of the children had increased with 0.4 cm – boys, and 0.3 cm – girls for a very short period of two years (from 1944-45 to 1946-47), the growth in both genders is only 0.1 cm in the last 10 years (1975-76 - 1985-86) of the sub-period. A significant delay is registered in the increase rate of the body mass. In the last period is recorded a similar slowing of the growth of the body mass and the height also in Moscow and Almaty (Volkova, 1988). A number of authors say that the gradual slowing of the acceleration rate is related to the improvement of the living conditions (Kazny, 2004; Karanica, 1999; Dimitrov, 1990; Vlastovskii, 1988; Koleva, 1985). When studying the interrelation between the acceleration processes and the material prosperity, Zeltser notices that the acceleration is much stronger in individuals, whose development has been impaired due to various influences (Zeltzer, 1978).

After 1985 the economic status of the population starts to decline, and after 1990 the adverse effects in the public and personal life have worsened. The results of these events are negative acceleration changes in the newborn children. The average value of the body mass of the boys decreases with 345 g compared to 1985 and is the lowest value registered in the 70-year period. The body weight of the girls has declined with 122 g compared to 1985 and is at the level of 1946-47. The inter-group comparison between 1985 – 1995 shows that the differences are statistically significant $P<0.001$, with values of the criteria for normal distribution $u = 12.51$ for boys and $u = 4.74$ for girls. The height of the boys has decreased with 1.47 cm compared to 1985, and like the body mass is the lowest for the 70-year period. The height of the girls has declined with 0.90 cm, and like the body mass is at the level of 1946-47. The changes in the height have been confirmed with the alternative hypothesis – $P <0.001$ ($u = 14.70$ for boys and $u = 9.57$ for girls).

The hypothesis that the gradual improvement of the socio-economic conditions in the country after 1998 will result in positive acceleration changes in the newborn children compared to the preceding period was confirmed in regard to their body mass, more noticeable at boys, less at girls – $P<0.001$ ($u = 4.13$ girls and $u = 2.49$ boys). With the height, another observed anthropometric index, the negative tendency continues at girls, in 2009 it is with 0.47 cm less than in 1995. With boys, there is stabilization with a slight increase of 0.17 cm.

Table 2: Distribution of the newborn boys in percent of the body mass in the separate observed periods

Body	**Years of Survey**							
Mass	**1939/40**	**1944/45**	**1946/47**	**1965/66**	**1975/76**	**1985**	**1995**	**2009**
2500-3000	24.7	25.4	24.3	21.3	15.8	12.6	21.8	19.8
3001-3500	52.3	52.6	48.9	39.8	58.9	36.5	46.3	42.3
3501-4000	17.6	16.8	20.6	29.8	32.2	39.7	28	33.1
4001 +	5.4	5.2	6.2	9.1	13.1	15.2	3.5	4.8
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Author

The in-depth analysis of the observed anthropometric indices shows that negative changes in the physical development of the newborn children in Plovdiv are a result of the decreased relative share of the larger fetuses (see Table 2 and Table 3). Throughout the whole first period, except for 1944-45, there is a clear tendency of increasing the share of the newborns with body weight above 3 500 g. With boys, the range is between 23.0 % in the pre-war year to 54.9% in 1985; it represents an increase of 31.9%. With girls, during the first survey, the share of the newborn above 3 501 g is 15%, to reach 41.8% in 1985. In the period 1985 – 1995 the body mass of the newborns with weight above 3 500 g decreases by 23.4% with boys and by 16.7% with girls (see Tab.3). As already mentioned, in the last period 1995 – 2009, there were some positive changes in the body mass, but with boys, it is still close to the values of 1946-47. With girls, the change is much better and is at the level of 1965-66.

Table 3: Distribution of the newborn girls in percent of the body mass in the separate observed periods

Body mass	Years of Survey							
	1939/40	**1944/45**	**1946/47**	**1965/66**	**1975/76**	**1985**	**1995**	**2009**
2500-3000	33.5	34.5	31.3	27.7	21.7	18.6	26.4	29.5
3001-3500	51.5	50.7	47.3	43.8	40.3	39.6	47.5	41.5
3501-4000	12.2	12.6	17.5	24.0	30.5	33.5	22.8	25.9
4001 +	2.8	2.2	3.9	4.5	7.7	8.3	3.3	4.1
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Author

Conclusions:

1. This survey is the most extended study of the physical development of the new-born children in the history, not only in our country but according to the literary sources, for the last 70 years in the world.
2. The dynamic changes in the height and the body mass of the newborns in the different sub-periods allows to categorically confirm the thesis that the accelerative changes start in the antenatal period.
3. The survey allows the assertion that the accelerative changes in the ontogenetic development are based on social factors.

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