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Changes in Body Size of Newborns in Lithuania, 1974–2004

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A B S T R A C T

The purpose of this study was to analyse body size of Lithuanian newborns born in 1998 and 2004, and to compare results with the data from 1974. The main body size measurements – body weight, body length and body mass index (BMI) of 3,281 (1,705 boys and 1,576 girls) live term singleton Lithuanian newborns' were analysed according to gestational age, sex and health status. The data were collected in the Clinic of Obstetrics and Gynaecology of Vilnius University (VU COG), and the comparison with the data of Lithuanian Medical Birth Register of (LMBR) was performed. No significant differences between height, weight and body mass index in 1998 and the same characteristics in 2004 were observed. Means and principal percentiles (10^{th}, 50^{th}, 90^{th}) of body measurements of 37–42 weeks of gestational age newborns were obtained. The mean body length was 52.8/52.19 cm (boys/girls), body weight – 3,589/3,454 g, BMI 12.82/12.64 correspondingly. The recent data were compared with the similar data from 1974 cohort. Statistically significant increment of body length of Lithuanian newborns was observed in all age and sex groups, whereas weight changes were less evident. The analysis of BMI demonstrated the following trend: newborns became longer, but not relatively heavier in comparison with the similar data 30 years ago. Hence, it is important to evaluate weight changes of neonate in relation with the changes in height. Further investigation of prevalence of neonatal macrosomia, possible factors of body size changes, their relationship to general health status and further health issues of the child should be explored.

Key words: *newborns, height, weight, body mass index, body size changes, Lithuania*

Introduction

In Lithuania, as in most European post-communist countries, the demographic situation has been deteriorating during the latest decade (Table 1). According to the data from the Department of Statistics under the Government of the Republic of Lithuania, the average number of children born per woman during her life has decreased from 2.0 in 1990 to 1.3 in 2004[1]. Infant mortality, one of the most important public health indicators, has decreased from 16.5 in 1992 to 7.9 in 2004[2–4]. According to WHO recommendations, in Lithuania all 22-week gestational age infants over 500 g are considered to have been born alive. According to infant mortality, Lithuania is 33rd among European countries[5].

Despite the fact that the country's economic indicators are improving (Table 1), there are still some problems in the social sphere[6]. The number of children living in families with an increased social risk is growing. At the end of 2004, 16.9 thousand families, including 36.9 thousand children, with an increased social risk (up from only 7 thousand in 1990) were registered in Lithuania[7]. The increasing gap in social-economic conditions between different population groups is inevitably affecting the health of the new generation, including newborns.

The greatest human growth intensity is during the intrauterine period[8]. The rate of intrauterine evolution depends on biological factors and environmental conditions. Biological factors include ethnicity[9,10], the number of foetuses[8], foetus gender[11,12], the mother's genotype[8], maternal age[11,13,14], and the mother's body size indicators[8,11,15,16], the state of her health – obesity, diabetes, and hypertension are among the major factors[14,17,18], the number of previous births[10,11,14,19].

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TABLE 1
SOME DEMOGRAPHIC AND ECONOMIC DATA OF LITHUANIA 1990–2004[1–4,6]

Year	Birth rate	Natural increase	Infant mortality	GDP (mill. litas)	Inflation rate (%)	Unemployment rate (%)
1992	14.3	3.3	16.5*	3,406	1161.0	3.0**
1995	11.4	–1.1	12.4	25,568	39.6	6.1**
1997	10.6	–0.9	10.3	39,378	8.9	14.1***
1998	10.4	–1.1	9.2	44,377	5.1	13.2***
1999	10.3	–1.0	8.6	42,597	0.8	14.6***
2000	9.8	–1.3	8.5	45,526	1.0	16.4***
2001	9.1	–2.5	7.8	48,563	1.3	17.4***
2002	8.6	–3.2	7.9	51,643	0.3	13.8***
2003	8.9	–3.0	6.8	56,772	–1.2	12.4***
2004	8.8	–3.2	7.9	62,440	2.9	11.4***

GDP – Gross Domestic Product, * – In 1991 registration of newborns changed: all infants over 500 g and 22 week of gestational age are considered to have been born alive, ** – Jobcentre data, *** – Labor force survey data

Social-economic conditions are considered a major environmental factor[9,20]. It has been found that, under favourable environmental conditions, the mean values of newborn body size indicators increased whereas the variation coefficients decreased. This has been proven by the data from several countries: the average birth weight is higher in countries with a higher standard of living [15,16,21]. Many studies have been made on the effect of smoking, alcohol, caffeine, and the mother's marital status and education on newborn weight[8,11,15–17,19].

It well known that newborn's physical status, body size indicators are closely interrelated with his general health status. The main indicators of physical status include weight, height (body length), head and chest circumference. Body weight data have been used in most studies.

According to WHO recommendations[23], a full-term newborn (37–42 week gestational age) should weigh at least 2,500 g. Low-weight newborns are divided into three groups: those with low body weights of less than 2,500 g; those with very low body weights of less than 1,500 g, and those with extremely low body weights of less than 1,000 g[22–25]. Low weight of the newborn may be caused by retarded intrauterine development or/and premature birth. The survival of newborns with very low or extremely low birth weight always requires special efforts by health providers[23,25,26]. The upper limit of normal birth weight has not been definitely determined. According to WHO recommendations[22,23], weight over 4,000 g is associated with macrosomia. Some authors suggest considering the macrosomia weight limit to be 4,100 g or 4,200 g[14,24]. According to some authors[17], the gradation and correction of the large newborn weight should be made taking into consideration the gestational age and the gender of the newborn: 4,100 g for males and 4,000 g for females. Extremely heavy newborn weight over 4,500 g or 5,000 g is connected with a risk of death[23].

Body size of newborn, by taking into consideration gestational age, reflects the physical development of an individual. By evaluating a newborn's gestational age and body weight, newborns are categorised as: SGA – *small* for gestational age, AGA – *appropriate* for gestational age, LGA – *large* for gestational age. There are different criteria for determining these categories. These criteria are usually based on the percentiles estimated for a certain population: the 10th percentile is considered the limit between SGA and AGA and the 90th percentile the limit between AGA and LGA[23].

Large deviations in newborn body weight from the mean values are associated with perinatal pathology and impaired adaptation during the postpartum period[27]. SGA infants have an increased risk of death[8,26], hypothermia, hypoglycaemia[28], hypocalcaemia, polycythemia[29], cerebral haemorrhage[19], and neurocognitive complications due to pre- or postpartum hypoxia[23,30,31].

LGA infants more frequently experience such birth injures as fractured clavicles, dislocated shoulders, brachial plexus injuries[14,30], cephalohematomas[29], cerebral circulation disorders[20], and asphyxia due to obstructed childbirth[23,32]. The Apgar-Index for LGA infants is often low during the first and fifth minutes postpartum[14,31]. A weight over 4,000 g increases the risk of neurological complications[32], intervention during labour (induced childbirth, Caesarean sections, and episiotomies), and obstetrical perineum injuries[14,30,32].

Physical development and growth impairment disorders are often observed in early childhood among SGA children[25]. It has been established that SGA children have an increased risk of vision and hearing disorders, orthopaedic deformations, and learning problems. The risk increases if SGA children are born into families with an increased social risk[20]. The rate of growth for LGA children slows postpartum. However, the newborn health indicators remain higher compared to the mean indexes for the general population and are around the 70th percentile[25].

Extreme body weight values at the moment of birth affect an individual's health throughout life. Population

studies have proven that a large weight at the moment of birth and rapid postnatal growth are risk factors for Type 1 diabetes in childhood[33] and some childhood cancers as well as breast and prostate cancer[32]. A connection has been established between SGA and the risk of the following diseases: cardiovascular system diseases, ischemic heart disease[34,35], hypertension[36–38], insulin resistance and Type 2 diabetes[34,35], abnormal lipid metabolism and polycystic ovarian syndrome[34] in adult ages.

Newborn indicators are variable in different populations, ethnic groups, and social-economic groups[13]. In most countries, standards of physical development of newborns have been developed[10,21,39].

The aim of this work was to analyse the main indices of physical status of newborns in the homogenous Lithuanian population of Vilnius for 1998–2004 and to compare these results with the data from 1974[40].

Material and Methods

The data for this study were collected in the largest obstetrical clinic in Vilnius, the Vilnius University Clinic of Obstetrics and Gynaecology (VU COG). The newborn body size indicators – body weight, body length and body mass index (BMI) of the full-term, singleton newborn boys and girls of Lithuanian and other nationalities, born at the VU COG in 1998 and 2004 were studied. The comparison of newborns of Lithuanian and other nationalities was performed. The nationality of newborn was determined by the mother's nationality.

The body weight was obtained using the electronic scale with 10 g error; body length was measured with 1 cm error, following WHO recommendations and the protocol for neonatal anthropometry[22,23]. Data from 1,475 newborns (758 boys and 717 girls) born in 1998 and 1,816 newborns (947 boys and 869 girls) born in 2004 were analysed. The significant increase in the number of newborns is due to the closure of one obstetric clinic in Vilnius and the subsequent redistribution of pregnant women to the VU COG.

TABLE 2
DATA OF VU COG: NUMBER OF SINGLETON NEWBORNS OF LITHUANIAN NATIONALITY IN DIFFERENT GENDER AND GESTATIONAL AGE GROUPS

Gestational age (weeks)	Boys, N		Girls, N	
	1998 year	2004 year	1998 year	2004 year
37	54	68	28	50
38	89	140	98	114
39	158	282	157	289
40	390	406	371	362
41	62	48	61	52
42	5	3	3	2
Total	758	947	718	869

All the newborns born in the same year have been grouped by sex and gestational age (Table 2). The gestational age was established according to the last menstruation date. The group with a 42-week gestational age was excluded from further analysis due to its small number. All newborns (with and without pathologies) were analysed, and the comparison was made.

The statistical data analyses were performed using standard statistical programmes (EXCEL, SPSS). The major parameters (mean value and standard deviation) and the main percentiles of each characteristic of body size were calculated. ANOVA analysis was used for revealing the differences between data from 1998 and 2004, also for different health status groups. Percentiles were established using two methods: natural and »theoretical«. In the first case, all the sampled data were used, and percentiles were extracted according to »natural« distribution of certain measurement. In the second, the percentiles were estimated mathematically, the 50^{th} percentile being considered the mean value; the other percentiles were obtained by applying the standard deviation (10^{th} percentile = X–1.28 SD; 90^{th} percentile = X+1.28SD).

The results obtained were compared to the data of Lithuanian Medical Birth Register (LMBR) and with the results of a 1974 study of newborns.

Results and Discussion

Comparative analysis of Lithuanian Medical Birth Register (LMBR) and data of Vilnius University Clinic of Obstetrics and Gynaecology (VU COG)

It is generally known that newborn postpartum health indicators vary by gender[8,11,12,14,19]. The mean values for newborn body weight, exclusive of gender, were estimated and compared to the VU COG and LMBR data[41,42]. This was done, because the Register publishes the mean body weight of all newborns, exclusive of nationality and gender, as well as the mean body weight of the full-term and premature newborns and the percentage of newborns by body weight (under 500 g, 500–999 g, 1,000–1,499 g, 1,500–2,499 g, 2,500–3,499 g, 3,500–4,499 g, and over 4,500 g).

The data of weight status of Lithuanian newborns from the LMBR and VU COG are compared in Table 3. The statistical mean body weight of all full term newborns at the VU COG is significantly lower than the national mean body weight (LMBR). This fact could be explained as follows: VU COG is the main perinatal pathology centre for Vilnius District, and newborns with an increased risk for different pathologies are born here, and it could significantly affect the deviation of the mean values of weight of newborns in VU COG from the national mean values presented by LMBR. For example, the percent of full-term newborns with a body weight under 2,500 g is significantly larger in VU COG than in all Lithuania. However, the VU COG data obtained by analysing

TABLE 3
COMPARISON OF WEIGHT STATUS OF FULL-TERM NEWBORNS FROM LMBR[41,42] AND FULL-TERM NEWBORNS FROM VU COG

Year	1998	2004
Alive newborns in Lithuania (LMBR)	94.8%	94.7%
Alive newborns in VU COG	87.2%	90.2%
Small weight newborns (<2,500 g) in Lithuania (LMBR)	1.4%*	1.7%*
Small weight newborns (<2,500 g) in VU COG	2.0%*	2.1%*
Large weight newborns (>4,500 g) in Lithuania (LMBR)	2.2%*	1.9%
Large weight newborns (>4,500 g) in VU COG	1.5%*	1.9%
Mean weight (g) of newborns in Lithuania (LMBR)	3,522*	3,516*
Mean weight (g) of newborns in VU COG	3,493*	3,489*
Mean weight (g) of newborns of Lithuanian nationality in VU COG	3,529	3,525

LMBR – Lithuanian Medical Birth Register, VU COG – Clinic of Obstetrics and Gynaecology of Vilnius University, *p<0.05

TABLE 4
DESCRIPTIVE STATISTICS OF BODY SIZE INDICES OF FULL-TERM SINGLETON NEWBORN BOYS AND GIRLS OF LITHUANIAN NATIONALITY

Gender	Index	1998 year		2004 year	
		X	SD	X	SD
Boys	Weight (g)	3,614	457.0	3,589	469.4
	Body length (cm)	52.8	2.1	52.8	2.2
	BMI	12.9	1.1	12.8	1.1
Girls	Weight (g)	3,440	419.9	3,454	445.3
	Body length (cm)	52.0	1.9	52.2	2.1
	BMI	12.7	1.1	12.6	1.0

only full-term, single-birth newborns of Lithuanian nationality allowed mean values analogous to the national mean values (LMBR) to be obtained. It may be assumed that ethnic factors are significant since the highest percentage of ethnic minorities lives in Vilnius District. Inhabitants of Lithuanian ethnicity comprise 83.5% of Lithuania's population. In Vilnius District, this percentage is significantly lower at 56.4%[1]. 775 (29.4%) of the 2,639 full-term newborns born at the VU COG in 2004 were of non-Lithuanian ethnicities (Poles, Russians, Byelorussians, Ukrainians and others). Further analysis of body size of newborns with different nationalities taking into account socio-economical and other factors should be preformed to confirm the above-mentioned hypothesis.

Analysis of body size of newborns from VU COG, 1998 and 2004

The analysis has not established a statistically significant difference between the mean values for the body weight, body length and body mass index of all the full-term, single-birth newborns of Lithuanian ethnicity born in 1998 and 2004 ($p<0.05$, Table 4).

There was no difference between the data set of all full-term and the data of only healthy neonates (Table 5 and 6): here data of all full-tem babies are presented without brackets, data of neonates without any diagnose of pathology are shown below in brackets. It has been established that the variability of the measurements in groups that included all children (both healthy and pathological) is higher than the variability in groups that included only healthy children. Since the mean values for the newborn body size indicators do not significantly differ, it may be assumed that the data for children with certain clinical diagnoses does not significantly affect the mean indices for all the sampled data and that this data may be considered together with the data for healthy children. Similar conclusions have also been made by other authors[32]. Perhaps, this is due the fact that inborn pathology usually varies within the few percents among different populations and could not effect general data significantly.

The analysis allows one to establish that there are no significant differences according to body length, weight, and BMI among the children born in 1998 and 2004 in most of the groups formed according to sex and gestational age (Table 5 and 6). Statistically, BMI has significantly decreased in the group of healthy, 39-week boys. In the same group, the mean body weight has decreased within the limits of a mathematically insignificant difference while the body length has remained the same. The body length and weight of all 40-week girls have significantly increased while the BMI has remained the same. In the group of healthy girls of the same age, the body length has increased while the body weight has remained

TABLE 5
DESCRIPTIVE STATISTICS OF BODY SIZE INDICES OF FULL-TERM SINGLETON NEWBORN BOYS OF LITHUANIAN NATIONALITY ACCORDING TO GESTATIONAL AGE

GA (weeks)	Year	Weight (g)		Height (cm)		BMI	
		X	SD	X	SD	X	SD
37	1998	3,149 (3,170)	422.5 (329.9)	50.6 (50.8)	2.5 (1.8)	12.3 (12.3)	1.0 (0.8)
	2004	3,143 (3,168)	434.5 (295.4)	50.7 (50.6)	2.3 (1.7)	12.2 (12.4)	0.9 (0.5)
38	1998	3,424 (3,414)	498.2 (413.9)	52.1 (52.0)	2.0 (1.8)	12.6 (12.6)	1.3 (1.0)
	2004	3,376 (3,365)	477.3 (320.4)	52.2 (52.2)	2.1 (1.7)	12.4 (12.3)	1.1 (0.8)
39	1998	3,561 (3,560)	412.5 (329.3)	52.4 (52.5)	1.8 (1.6)	12.9 (12.9)*	1.0 (0.9)
	2004	3,559 (3,499)	414.5 (301.3)	52.6 (52.5)	2.0 (1.7)	12.8 (12.7)*	1.0 (0.9)
40	1998	3,721 (3,701)	425.6 (350.6)	53.3 (53.2)	2.0 (1.9)	13.1 (13.1)	1.1 (1.0)
	2004	3,736** (3,648)**	428.4 (302.1)	53.4** (53.1)**	2.0 (1.6)	13.1 (12.9)	1.0 (0.8)
41	1998	3,739 (3,736)	356.4 (300.1)	53.3 (53.3)	1.5 (1.4)	13.1 (13.2)	1.0 (0.8)
	2004	3,769 (3,653)	454.8 (347.7)	53.5 (52.8)	2.0 (1.5)	13.2 (13.1)	1.0 (0.9)

Data of sample of healthy babies are presented in brackets; GA – gestational age; * – statistically significant difference in subgroups (total samples and healthy samples) between data of different years of birth; ** – statistically significant difference between data of total and healthy samples of the same year of birth, $p<0.05$.

the same, which has caused a significant decrease in the BMI. Similar BMI variations have been established in the group of 41-week girls: the BMI decreased due to an increase in the body length while variations in the body weight were within the limits of a mathematically insignificant difference. It may be assumed that the body weight and length of 40-week and 41-week girls in 2004 exceeded the similar indices of girls born 6 years ago, but BMI index did not change. Hence, more marcosomic girls could be obtained in 2004 than in 1998.

Based on the results of the study, it may be concluded that the body weight of newborns of Lithuanian nationality did not increase for 1998–2004 in most groups formed according to sex and gestational age. Though variations in the body length and BMI show a tendency for body length to increase and relative body weight of newborns to decrease, no statistically significant trend could be proved by body size changes that occurred sporadically only in babies of few gestational age groups.

Because significant differences in the indices of body size have not been found in data from 1998 and 2004, the data for both these years has been united into one group, and percentiles were extracted. The mean »natural« and »theoretical« percentiles for body weight, body length, and BMI, which have been averaged using the sliding method, are presented in Figure 1, 2, 3, 4, 5 and 6. It is obvious that the percentiles formed using the mathematic method (»theoretical«) actually coincide with the percentiles reflecting the »natural« distribution of the qualities in the population. Hence, it may be assumed that right-sided asymmetry, which is found in the distribution of body weight and BMI in older ages, is not incidental to a variation in newborn body size indices immediately after birth. The analysis allows one to conclude that both methods for percentile estimation may be used for evaluating newborn physical development.

Changes in the body size of newborns during 1974–2004

The fact that the body weight of infants born recently exceeds the body weight of infants born 10–15 years ago has been established in some developed countries including: the US, Canada, the UK, Finland, Norway, and Denmark[21,24,32,39,43,44]. In France, no such phenomenon has been established[24]. The largest increase in the body weight has been observed in infants born at 37–41 weeks of gestation[32]. Most authors evaluate the variation in body weight using mean values. The percentile method has only been using in a few studies[21,39]. Only few studies concerning variation of newborn growth and BMI have been published up to now.

Anthropologists have studied the physical development of Lithuanian newborns in detail. They used the standard anthropometric method in their studies; there-

TABLE 6
DESCRIPTIVE STATISTICS OF BODY SIZE INDICES OF FULL-TERM SINGLETON NEWBORN GIRLS OF LITHUANIAN NATIONALITY ACCORDING TO GESTATIONAL AGE

GA (weeks)	Year	Weight (g)		Height (cm)		BMI	
		X	SD	X			X
37	1998	3,078 (3,182)	454.2 (364.9)	50.6 (51.1)	1.9 (1.9)	11.9 (12.1)	1.3 (0.9)
	2004	3,009 (3,008)	478.7 (318.7)	50.1 (50.0)	2.5 (1.4)	11.9 (12.0)	1.1 (1.1)
38	1998	3,227 (3,265)	357.0 (324.8)	51.2 (51.3)	1.5 (1.6)	12.3 (12.4)	1.1 (0.9)
	2004	3,254 (3,268)	425.2 (301.3)	51.3 (51.3)	2.0 (1.8)	12.3 (12.4)	1.1 (0.9)
39	1998	3,401 (3,421)	401.4 (325.5)	51.7 (51.8)	2.0 (1.7)	12.7 (12.8)	1.1 (1.0)
	2004	3,419 (3,430)	409.6 (328.6)	51.9 (52.0)	2.0 (1.8)	12.6 (12.7)	1.0 (0.9)
40	1998	3,514* (3,520)	404.5 (334.9)	52.3* (52.3)*	1.8 (1.6)	12.8 (12.9)*	1.0 (0.9)
	2004	3,584**,* (3,524)**	412.1 (304.5)	52.8* (52.7)*	1.8 (1.6)	12.8 (12.7)*	1.0 (0.8)
41	1998	3,584 (3,526)	429.4 (356.0)	52.4* (52.1)	2.2 (2.0)	13.0* (13.0)*	1.0 (0.7)
	2004	3,604 (3,470)	398.9 (250.4)	53.3* (52.9)	1.7 (1.3)	12.7* (12.4)*	0.8 (0.6)

Data of sample of healthy babies are presented in brackets; GA – gestational age; * – statistically significant difference in subgroups (total samples and healthy samples) between data of different years of birth; ** – statistically significant difference between data of total and healthy samples of the same year of birth, $p<0.05$.

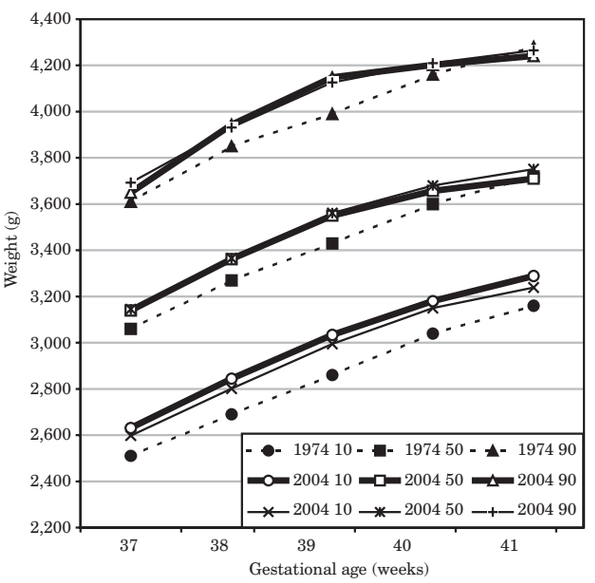

Fig. 1. The 10th, 50th and 90th percentiles of weight (g) of male Lithuanian newborns, 1974–2004. Dotted lines – »theoretical« percentiles from data 1974; thick lines – »natural« percentiles from data 1998 and 2004; thin lines – »theoretical« percentiles from data 1998 and 2004.

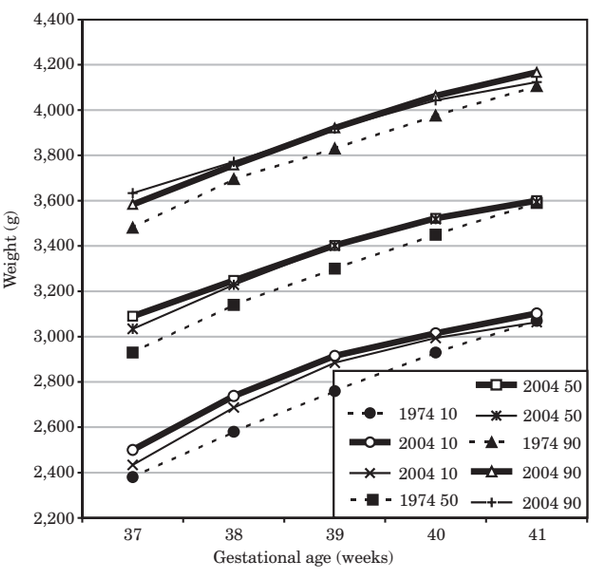

Fig. 2. The 10th, 50th and 90th percentiles of weight (g) of female Lithuanian newborns, 1974–2004. Dotted lines – »theoretical« percentiles from data 1974; thick lines – »natural« percentiles from data 1998 and 2004; thin lines – »theoretical« percentiles from data 1998 and 2004.

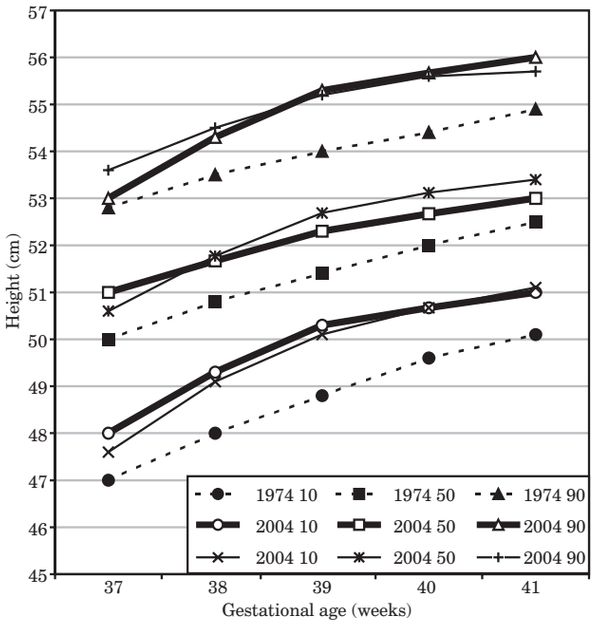

Fig. 3. The 10th, 50th and 90th percentiles of height (cm) of male Lithuanian newborns, 1974–2004. Dotted lines – »theoretical« percentiles from data 1974; thick lines – »natural« percentiles from data 1998 and 2004; thin lines – »theoretical« percentiles from data 1998 and 2004.

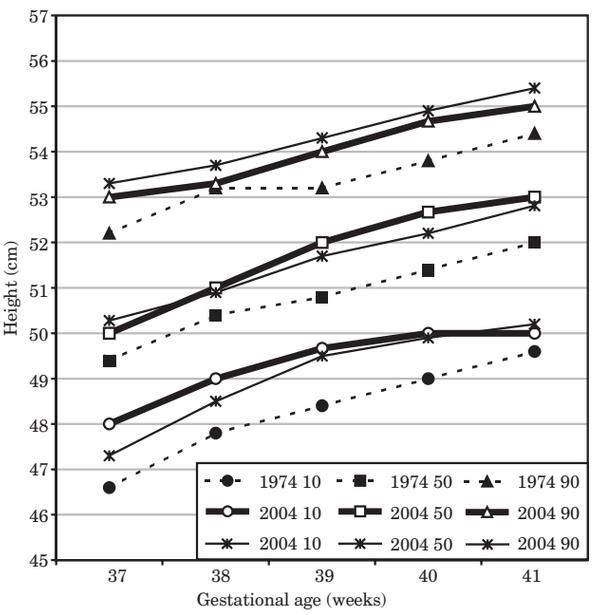

Fig. 4. The 10th, 50th and 90th percentiles of height (cm) of female Lithuanian newborns, 1974–2004. Dotted lines – »theoretical« percentiles from data 1974; thick lines – »natural« percentiles from data 1998 and 2004; thin lines – »theoretical« percentiles from data 1998 and 2004.

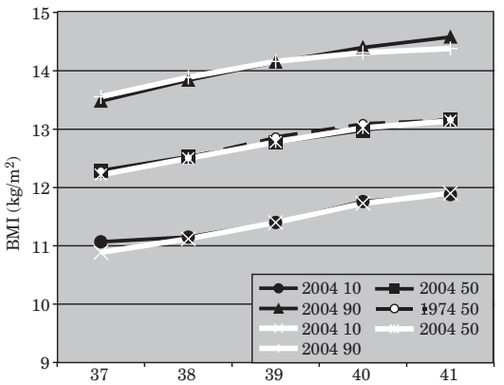

Fig. 5. The 10th, 50th and 90th percentiles of BMI of male Lithuanian newborns, 1974–2004. Dashed line – 50th »theoretical« percentile from data 1974; black line – »natural« percentiles from data 1998 and 2004.

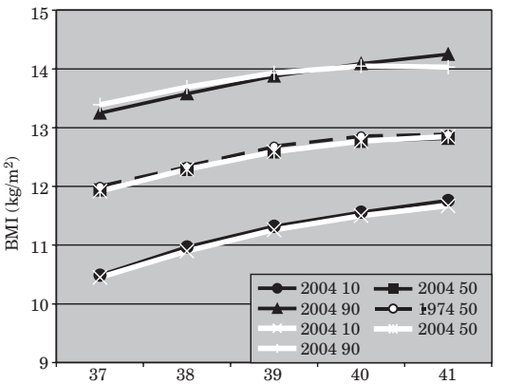

Fig. 6. The 10th, 50th and 90th percentiles of BMI of female Lithuanian newborns, 1974–2004. White line – »theoretical« percentiles from data 1998 and 2004; dashed line – 50th »theoretical« percentile from data 1974; black line – »natural« percentiles from data 1998 and 2004; white line – »theoretical« percentiles from data 1998 and 2004

fore the data from these anthropologic studies cannot be compared to the data obtained from maternity department registers. G. Cesnys in 1966–1967 performed the longitudinal study of infants from the moment of birth until one year of age and the main body size indices were studied[45]. J. Tutkuviene studied the main body size characteristics of newborns born in 1992–1995[46].

An extended retrospective study of body size of newborns in Lithuania was made in 1974. The data collected by the staff of five major Lithuanian area obstetric centres was evaluated for the first time using the percentile method. This data has been used for developing Lithuanian standards for newborn physical development[40]. Percentile tables have been formed on the basis of body length and weight data from 12,841 healthy newborns of 35–42 week gestation. In 1974 percentiles have been estimated using the mathematical method, the 50th percentile being considered the mean value.

As it was mentioned above, the data of newborns of Lithuanian nationality from VU COG did not differ significantly from the data of all Lithuania (LMBR). Therefore, it should be consumed that those data could be used for comparison with the data of all Lithuania. The main percentiles of newborn's body weight and length in 1974 and in 1998–2004 are compared in Figure 1, 2, 3 and 4. It is seen that body length of newborns for both sexes have clearly increased over the last 30 years. However, changes in body weight are not as obvious, although some increase is observed in the main percentiles of body weight. This coincides with the fact, that since seventies positive trend in body height of growing and adult Lithuanian population was detected, and stabilization of acceleration process was revealed only during the last decade[47]. From the other hand, no increase in BMI of boys and young males, but certain diminishing of BMI of adolescent girls and young females was estimated during the last few decades[47,48]. Moreover, our last data shows, that pregnant women from VU COG during the last few decades also became higher and slimmer[49]. It could be assumed that both, mothers and newborns in Lithuania have had very similar changes in body size during the same period.

Our analysis of height and weight of newborns shows, that body weight data does not allow one to assume an increase in the number of obese newborns, since an analysis of body weight alone without evaluating body length does not reflect overweight or obesity. Neonate babies in 2004 became slightly bigger. In 1974, no BMI percentile data was presented; therefore only the mean values of BMI in 1974 could be compared with the data of 2004 (Figure 5 and 6): no evident change between mean values of BMI in 1974 and the 50th percentile of BMI in 2004 was determined. Further analysis of macrosomic neonates, prevalence of obesity among Lithuanian neonates, relation of newborn body size indices with general health status of the child should be performed.

Conclusions

1. Body weight of newborns form VU COG is smaller in comparison with data of all Lithuania. This is because of a larger number of premature infants, newborns with delayed intrauterine development, and children of non-Lithuanian nationality are born at this hospital (the perinatal pathology centre). However, an analysis of only full-term, single-birth children of Lithuanian nationality has shown that the mean body weight values of these children coincide with the national data (LMBR). This indicates that a deeper analysis of the physical status of newborns of other nationalities, also the study of socio-economic factors must be made to determine reasons of bigger body size of newborns of Lithuanian nationality.
2. The analysis of the body length, body weight and BMI allows one to draw the conclusion that the physical status of newborn must be evaluated not only according to body weight but also other weight status indices should be considered.
3. The body length of both girls and boys is bigger than those 30 years ago. However, the body weight has not significantly increased for the same period of time, moreover, relative body weight of Lithuanian children did not change since 1974. This indicates that the standards for newborn body length and weight must be updated and new standards developed.

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PROMJENE U VELIČINI TIJELA NOVOROĐENČADI U LITVI, 1974.–2004.

S A Ž E T A K

Cilj ovog istraživanja bila je analiza veličine tijela novorođenčadi rođenih u Litvi 1998. i 2004.g., i usporediti rezultate s podacima iz 1974.g. Analizirane su glavne mjere veličine tijela – tjelesna težina, duljina i indeks tjelesne mase (BMI) na uzorku od 3281 (1705 dječaka i 1576 djevojčica) pravovremeno rođene žive novorođenčadi (ne uključujući blizance) u skladu sa gestacijskom dobi, spolom i zdravstvenim statusom. Podaci su sakupljeni na Klinici za Obstetriku i Ginekologiju Sveučilišta u Vilniusu (VU COG), a usporedba je napravljena sa podacima Litvanskog Medicinskog Registra Rođenih (LMBR). Tjelesna težina izmjerena je pomoću elektroničke vage s greškom od 10 g; duljina tijela izmjerena je sa greškom od 1 cm, u skladu sa preporukama WHO-a i protokolom za neonatalnu antropometriju. Nisu ustanovljene nikakve značajne razlike u težini, duljini i indeksu tjelesne mase između 1998. i 2004.g. Dobivene su srednje vrijednosti i glavni percentili (10, 50, 90) tjelesnih mjera novorođenčadi gestacijske dobi 37–42 tjedna. Srednja vrijednost duljine tijela iznosila je 52,8/52,19 cm (dječaci/djevojčice), tjelesna težina – 3589/3454g, BMI 12,82/12,64. Noviji podaci uspoređeni su s onima iz 1974.g. Statistički značajan porast duljine tijela litvanske novorođenčadi primijećen je u svim dobnim skupinama oba spola, dok su promjene težine bile manje izražene. Analiza BMI-a pokazala je slijedeći trend: novorođenčad postaje dulja, ali ne relativno teža u usporedbi sa podacima od prije 30 godina. Zbog toga je važno procjenjivati promjene u težini novorođenčadi s obzirom na promjene u duljini. Potrebno je provoditi daljnja istraživanja prevalencije neonatalne makrosomije, mogućih čimbenika promjene tjelesne veličine, njihove povezanosti s općim zdravstvenim statusom te istraživanja ostalih zdravstvenih pitanja vezanih uz djecu.