Original Article

Evaluation of growth in very low birth weight preterm babies

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Abstract

Aim: The aim of this study was to evaluate physical growth of very low birth weight (VLBW) preterm babies at a mean age of three years and to investigate the factors which affected growth.

Material and Methods: The factors including maternal problems, prenatal problems, early neonatal problems, nutrition, familial socioeconomical status and presence of chronic disease which affected catch-up growth in terms of height and weight in VLBW infants followed up in the neonatal intensive care unit (NICU) of our hospital were examined. The target height formula was used in assessment of growht in height and the contribution of genetic properties was investigated. The points of the subjects on the growth curve were plotted according to the Percentile Curve of the Turkish Children prepared by Neyzi et al. The states of the subjects with and without intrauterine growth retardation (were compared. The study was intitiated after obtaining approval from the ethics committeee of our hospital (100/25.10.2005).

Results: One hundred and seventeen preterm babies (57 females and 60 males) with a mean adjusted age of 35.8±2.39 80 of whom were appropriate for gestational age (AGA), 28 of whom were symmetrical (small gestational age) SGA and 9 of whom were asymmetrical SGA were included in the study. The mean gestational age (GA) was found to be 31±2.16 weeks and the mean birth weight (BW) was found to be 1271±226 g. The mean current height was found to be 92.06±4.90 cm. The mean weight was found to be 12.98±1.94 kg. The mean target height was calculated to be 163.66±8.1 cm (157.20 cm for the girls and 170.20 cm for the boys). It was found that 15 preterm babies (12.8%) could not achieve the target height (girls: 6%, boys: 6.8%). The risk factors related with failure to achieve target height were found to include ventilator treatment, presence of chronic disease, advanced stage intracranial bleeding (ICB), posthemorrhagic hydrocephalus, absence of breastfeeding, failure to sit at the table with the family and malnutrition. The maternal age, early rupture of membranes (PROM), preeclampsia, smoking, early neonatal problems, gender, being AGA and SGA, gestational age, birth weight and socioeconomical level were statistically insignificant in terms of achieving target height (p>0.05).

Conclusions: If very low birth weight preterm babies have no chronic disease and condition leading to neurodevelopmental retardation and if they are breastfed early and continuously (0-24 months), they can achieve catch-up growth similar to term babies. In examination of growth in terms of height, using target height may be more appropriate to shown the genetic potential. (Türk Ped Arş 2014; 49: 289-98)

Key words: Growth, preterm baby, target height

Introduction

Preterm babies are seperated from term babies because of the factors including different biological structures, severe prematurity problems, requirement for long hospitalizations and tendency to infections and constitute a significant portion of the risky newborn group. Currently, very risky preterm babies survive owing to advanced medical technology, experienced teams, use of surfactant and prenatal steroid treatment. On the other hand, the future risks increase as the gestational week (GW) and birth weight (BW) of these babies decrease. Neurodevelopmental retardation and physical growth retardation are significant in the group below the 32nd week and 1500 g (1-4).

In the long-term follow-up, the neurodevelopmental course and physical growth should be evaluated in a very disciplined way with an integrated approach considering the problems of early period.

In this study, we examined the physical growth properties of very low birth weight (VLBW) preterm babies followed up in the neonatal intensive care unit at the adjusted age of 3 years in the light of prenatal, neonatal, genetic and environmental risk factors.

Material and Methods

This cohort study was conducted with preterm babies who were born at the gestational age of 32 weeks or below and with a birth weight of 1 500 g or below at the adjusted age of three years between 01.01.2002 and 12.31.2002 in the Ministry of Health Bakırköy Women's and Children's Diseases Education and Research Hospital. The study was initiated after obtaining approval from the ethics committee of our hospital (100/25.10.2005). The subjects were reached by way of the phone numbers and addresses obtained from the outpatient clinic and hospitalization files. The study was explained by interviewing with the parents and written consent was obtained. 117 preterm children who were compatible with the study criteria were included in the study.

The patients who could not be reached by phone or letter, all twins and triplets, the patients with congenital disease and chromosomal anomaly were excluded from the study.

Preterm baby developmental follow-up form and socioeconomical level scoring form directed to the families were applied to all subjects.

The name, surname, gender, address, phone number, examination date, physical examination findings, birth date, GH, DA, height head circumference, intrauterine growth properties (small for estational age "SGA" symmetrial and asymmetrical) were recorded by the Lubchenco curve in the follow-up form (5). The weight and height at the adjusted age of three years, adjusted and chronological age, parental ages, parental heights, target height and target height percentiles (THP) were recorded. Early neonatal problems, presence of chronic diseases, intracranial hemorrhage (ICH), bronchopulmonary dysplasia (BPD), retinopathy of prematurity (ROP), necrotizing enterocolitis (NEC), intensive care and mechanical ventilation support and nutritional history were recorded. Pregnancy history and smoking status of the mother, early rupture of the membranes (ERM) and hypertension were interrogated.

The level of income of the family, education level or the parents, occupation of the parents, consanguinity, number of children and household population and residental properties were recorded in the socioeconomical level scoring form and scored (1-2-3-4 points). The income level of the family was classified as low (below the minimum wage) and high (above the minimum wage). The parental education level was classified as uneducated, primary school, high-school and university. The maternal occupation was grouped as housewife, worker/officer, self-employment, high level and the paternal occupation was grouped as unemployed, worker/officer, self-employment and high level. The residental status of the family was grouped as squatter house, rental and householder and the number of rooms were grouped as 1, 2, 3, 4 and >4. The location of the floor was grouped as basement, ground floor and higher floors and the heating method was grouped as none, stove and central heating. The number of children was grouped as >5, 3-4, 2 and 1 and the household population was grouped as >8, 5-7, 4 and 3. The infomation obtained by this scoring was marked in the form as the socioeconomical level score.

The preterm children included in the study were taken into the examination room and systematic physical examination was performed by the physician who conducted the study. The children were evaluated as barefoot and with their underclothes. Harpenden Stadiometer was used for height measurement and Tefal weighing instrument was used for weight measurement. The parental heights were measured with the same method. The weight and height percentile values

of the subjects were assessed by plotting the values on the Neyzi et al. (6) Percentile Curve of the Turkish Children. Target height formula which used the parental heights was used because of the importance of genetic properties in terms of growth in height (7). The target height for males was calculated using the formula: paternal height + (maternal height +13)/2 and the target height for females was calculated using the formula: maternal height + (Paternal height -13)/2. The findings were recorded in the form.

One hundred and seventeen children were evaluated according to the preterm baby outpatient clinic follow-up properties and the subjects who were brought for follow-up visit at the 1, 3, 6, 9, 12, 18, 24 and 36th months were considered well followed up, the subjects who were brought for 5-6 times were considered moderately followed up and the subjects who were brought for less than 5 times were considered poorly followed up in the follow-up period of the first three years following discharge.

Preterm babies who did and did not achieve catch up growth were compared in terms of risk factors and familial socio-economical properties.

Statistical analysis
In the statistical analysis, the chi-square, Fisher's exact test and student's t test for independent samples were used. A p value of <0.05 was considered significant at a confidence interval of 95% in statistical evaluation.

Results

During the time when the study was conducted, 310 babies who were ≤32 gestational weeks and/or ≤1500 g were hospitalized in the neonatal intensive care unit of our hospital. 33 babies were lost during the neonatal and postnatal period. Thirty-three babies who died, 21 babies who were born from multiple pregnancies and 17 babies who were referred from our unit to other centers were not included in the study. Conclusively, it was planned to evaluate physical growth of 239 preterm babies at the adjusted age of three years. The data were obtained from computer database, hospital files and outpatient clinic follow-up forms.

One hundred and seventeen subjects were reached by way of phone and address information and were evaluated. 118 patients could not be reached because of change in phone and address information. Fourteen

patients did not accept evaluation. It was interrogated if the data of the preterm babies whom we could not reach and who did not accept evaluation were different from the study group and if they were statistically comparable. The birth weights of the patients whom we could not reach ranged between 750 and 1 895 g (mean: 1240±234.38). The gestational age was >30: 83 (68%), ≤30: 39 (32%). 62 of the patients were female and 60 were male. Eighty-four of the babies (68.9%) were appropriate for gestational age (AGA) and 38 (31%) were SGA. APGAR scores at the fifth minute were as follows: 106 babies (86.9%) >6, 16 babies (13.1%) ≤6. The frequency of postnatal risk factors in the patients whom we could not reach is shown in Table 1 (patients who could be reached: group 1 and patients who could not be reached: group 2). When the two groups were compared statistically, no significant difference was found according to being AGA or SGA (p>0.05). No significant difference was found between the APGAR scores at the fifth minute. APGAR was ≤6: 26 (22.2%) at the fifth minute in group 1 and 16 (13.1%) in group 2 (p>0.05). There was no significant difference between group 1 and 2 in terms of the time spent in the intensive care unit and presence of BDP, NEC, sepsis, meningitis and ICH (p>0.05). According to these results, the properties of the patients groups whom we could reach and could not reach were similar.

Findings of the patients whom we could reach
In the study group constituted by very low birth weight preterm babies, BW was 700-1 800 g (mean: 1271±226 g), GW was 236 weeks (mean: 31±2.16 weeks). Fifty-seven (48.7%) were female and 60 (51%) were male. According to growth properties, 80 of the subjects (68.4%) were AGA and 37 (31.6%) were SGA.

When the prenatal risk factors of the subjects were examined, it was found that 26.5% of the pregnant women were hypertensive, 22% had ERM and 11% smoked during pregnancy. Prenatal steroid treatment was administered in 35% (Table 2).

When the problems of the early neonatal period were evaluated, it was observed that 30% of the preterm babies were followed up in the neonatal intensive care unit and received mechanical ventilation and respiratory distress and sepsis were the most significant morbidities.

When we classified our subjects as the ones who could and could not reach the target height percentile (THP)

Table 1. Early neonatal problems in preterm babies who were included in the study (group 1) and who could not be reached (group 2)

	Group 1 n (%)	Group 2 n (%)
RDS	24 (20.5)	20 (16.4)
Follow-up in intensive care unit	39 (33.3)	37 (30.3)
BPD	9 (7.7)	3 (2.5)
Sepsis	24 (20.5)	21 (17.2)
Meningitis	9 (7.7)	6 (4.9)
≥Grade 3 ICH	8 (6.8)	8 (6.6)
NEC	11 (9.4)	9 (7.4)

BPD: bronchopulmonary displasia; ICH: intracranial hemorrhage; NEC: necrotizing enterocolitis; RDS: respiratory distress syndrome

Table 2. Demographic porperties of the subjects

	n	%
Maternal properties		
Hypertension	21	26.5
EMR	26	22.2
Smoking	13	11.1
Prenatal steroid	41	35
Maternal age mean±SD (years)	30.76±5.65	
Paternal age mean±SD (years)	34.51±5.92	
Properties of the newborn		
Gender	57 females/60 males	48.7/51.3
AGA	80	68.4
SGA	37	31.6
Gestational week mean±SD (weeks)	31±2.16	
Birth weight mean±SD (g)	1271±226	
Chronological age mean±SD (months)	35.8±2.39	
Adjusted age mean±SD (months)	32.8±2.26	

AGA: appropriate for gestational age; EMR, early rupture of the membranes; SGA: small for gestational age; SD: standard deviation

which constituted the objective of our study, it was found that 15 (12.8%) could not reach THP and 102 (87.2%) could reach or exceed THP.

When we compared our subjects by gender, 7 of the girls (6%) and 8 of the boys (6.8%) could not reach THP and the difference was statistically insignificant (p>0.05).

When the subjects were evaluated according to gestational week, 7 of 46 patients who were born below the 30th gestational week could not reach THP, while 8 of 71 patients who were born above the 30th gestational week could not reach THP (p>0.05).

No significant difference was found when the mean height values of the subjects who were AGA or SGA and who did not have any morbidity and pathological finding were evaluated (Table 3).

When the subjects whose mothers did and did not have hypertension in the prenatal period were compared, 5 (4.3%) of the children of 31 hypertensive mothers (26.5%) could not reach THP, while 26 (22.2%) could reach THP. Ten (8.5%) of 86 subjects (73.5%) whose mothers did not have hypertension could not reach THP, while 76 (65%) could reach THP. The difference was insignificant (p>0.05).

When the subjects whose mothers did and did not smoke during pregnancy and lactation were compared, three of 13 (11%) children who were exposed to smoking during pregnancy could not reach THP (p>0.05) (Table 3).

When the effect of early neonatal problems on growth were interrogated, it was observed that RDS, BPD, ROP, NEC, hypoglycemia, sepsis and meningitis were not statistically significant factors in terms of achieving the target height, but advanced ICH, hydrocephaly and mechanical ventilation support were efficient (Table 4).

When the preterm babies with and without a chronic disease were examined in our study, it was found that 6 (5.1%) of 19 (16.2%) patients with a chronic disease could not reach THP, while 9 (7.7%) of 98 (83.8) subjects who did not have any chronic disease could not reach THP. The difference between these two groups was statistically significant (p<0.05). Two of 6 patients who had chronic disease and could not reach THP were being followed up because of cerebral movement disorder and 4 were being followed up because of hydrocephaly. All of the subjects who were being followed up because of the diagnosis of "wheezy infant" did reach THP (Table 5).

A general overview of the growth properties of the subjects is summarized in Table 6.

When the frequency of outpatient follow-up visits of the preterm babies included in the study was examined, approximately 60% were observed to be followed up well and very well. When the effect of outpatient follow-up on achieving the target height was examined, it was found that 7 (6%) of 46 (39%) patients with poor

Table 3.   **Catch-up of target height by demographic properties of the subjects**

	The subjects who could not achieve the target height n (%)	The subjects who achieved the target height n (%)	Total n (%)	p
Gender				
Female	7 (6)	50 (42.7)	57 (48)	>0.05
Male	8 (6.8)	52 (44.4)	60 (51.3)	
AGA	9 (7.7)	71 (60.7)	80 (69)	>0.05
Symmetrical SGA	5 (4.3)	23 (19.7)	28 (23.9)	
Asymmetrical SGA	1 (0.9)	8 (6.8)	9 (7.7)	
Gestational week				
<30 weeks	7 (6)	39 (33.3)	46 (39.3)	>0.05
>30 weeks	8 (6.8)	63 (53.8)	71 (61.7)	
Maternal property				
Smoking	3 (2.6)	10 (8.5)	13 (11.1)	>0.05
Hypertension	5 (4.3)	26 (22.2)	31 (26.5)	
EMR	3 (2.6)	23 (19.7)	26 (22.2)	>0.05
Nutritional properties				
No breastmilk	10 (8.5)	40 (34.2)	50 (42.7)	<0.05
Breastmilk for 4-6 months	5 (4.3)	42 (36)	47 (40.3)	
Breastmilk for 6-24 months	0	20 (17)	20 (16.7)	
Habit of sitting at the table				
Absent	6 (5.1)	7 (6)	13 (11.1)	
Present	9 (7.7)	95 (85)	104 (88.9)	<0.05
Outpatient clinic follow-up				
Poor	7 (6)	39 (33.3)	46 (39.3)	
Good	8 (6.8)	63 (53.8)	71 (61.7)	>0.05
Socioeconomical level				
Low	1 (0.9)	13 (11.1)	14 (12)	>0.05
High	14 (12)	89 (76)	103 (88)	

AGA: appropriate for gestational age; EMR: early rupture of the membranes; SGA: symmetrically small for gestational age

follow-up could not reach THP, while 39 (33%) could reach THP. Eight (6.8%) of 71 (60.7%) patients with good follow-up could not reach THP, while 63 (53.8%) could reach THP. The difference was insignificant (p>0.05) (Table 3).

When preterm babies with a weight below the 3rd percentile were examined, it was found that a total of 9 subjects could not reach growth in terms of weight. 6 of these subjects could not reach the target height percentile either. When the reasons were examined, it was found that three had spastic tetraparesia, two had spastic diparesia and one was symmetircal SGA. One of the three subjects who had retarded weight and reached THP had spastic diparesia, one was symmetrical SGA

and one subject did not have any property. Six (5.1%) of 9 subjects who were retarded in terms of weight had a chronic disease in addition. The relation between presence of chronic disease and low weight was statistically significant (p<0.05).

When the subjects who did not receive breastmilk at all and/or who received breastmilk for one month at the most were compared with the ones who received breastmilk for at least 4-6 months and 6-24 months, 10 (8.5%) of 50 (42.7%) subjects who did not receive breastmilk at all could not reach the target height, while 40 (34%) could reach the target height. In the group who received breastmilk for at least 4-6 months, 5 (4.3%) of 67 subjects (57%) could not reach THP. The difference

Table 4. Early neonatal risk factors in the patients who could and could not achieve the target height

	The subjects who could not achieve the target height n (%)	The subjects who achieved the target height n (%)	Total n (%)	p
RDS	6 (5)	18 (15.4)	24 (20.5)	>0.05
BPD	3 (2.6)	6 (5)	9 (7.7)	
ROP	1 (0.9)	5 (4.3)	6 (5)	
Hypoglycemia	1 (0.9)	4 (3.4)	5 (4.3)	
NEC	1 (0.9)	10 (8.5)	11 (9.4)	
Sepsis	4 (3.4)	20 (17)	24 (20.5	
Meningitis	3 (2.6)	6 (5)	9 (7.7)	
ICH (>grade 3)	3 (2.6)	5 (4.3)	8 (6.8)	<0.05
Hydrocephaly	4 (3.4)	5 (4.3)	9 (7.7)	<0.05
EMR	3 (2.6)	23 (19.7)	26 (22.2)	>0.05
Intensive care	8 (6.8)	31 (26.5)	39 (33.3)	
Mechanichal ventilator	7 (6)	28 (23.9)	35 (29.9)	<0.05

BPD: bronchopulmonary displasia, EMR: early rupture of the membranes; ICH: intracranial hemorrhage; NEC: necrotizing enterocolitis; ROP: retinopathy of prematurity; RDS: respiratory distress syndrome

was significant, when the two groups were compared (p<0.05). When the age of onset of solid foods was examined, 3 (2.6%) of 17 (14.5%) subjects who started to receive solid foods at the age of 4-6 months could not reach THP, while 14 (12%) could reach THP. 12 (10%) of 98 (83.8%) subjects who started to recevie solid foods at the age of 6-12 months could not reach THP.

When the eating habits of our subjects were interrogated, it was learned that 104 (8.9%) children had the habit of sitting at the table with the family and sharing the same meal and 13 (11.1%) was fed at different times and in different ways. When these subjects were evaluated, it was found that 7 (6%) had no chronic disease, 4 (3.4%) had cerebral movement disorder and 2 had hydrocephaly with shunt. While 9 (7.7%) of 104 (88.9%) subjects who had gained the habit and ability of sitting at the tabel with the family could not reach THP, 95 (81%) did reach THP. Six (5%) of 13 (11.1%) of the subjects who had not gained this ability could not reach the target height. The difference was significant, when these two groups were compared (p<0.01).

When the socioeconomical scoring results of our subjects were placed in the bell curve, the median value was found to be 31±3.515 (24-42). In the light of this information, the mean socioeconomical score of 15 patients who could not reach THP was found to be 30.8, while it was found to be 31.55 in the patients who could reach THP. It was observed that 14 (12%) of 103 (88%)

Table 5. Catch-up of target height by presence of chronic disease

	The subjects who could not achieve the target height n (%)	The subjects who target achieved the height n (%)	Total n (%)
Cerebral palsy	4 (3.4)	6 (5.1)	10 (8.5)
Spastic diparesia	3 (2.6)	3 (2.6)	6 (5.2)
Spastic tetraparesia	1 (0.85)	3 (2.6)	4 (3.3)
Wheezy infant	5 (4.3)	0	5 (4.3)
No chronic disease	93 (79.5)	5 (4.3)	98 (93.8)
Total	102 (87.2)	15 (12.8)	117

Table 6. Growth properties of the subjects

	Mean±SD	Distribution
Current weight (kg)	12.98±1.94	9.00-18.50
Current height (cm)	92.06±4.90	78.00-105.00
Maternal height (cm)	156.49±5.66	143.00-173.00
Paternal height (cm)	170.90±6.58	155.00-186.00
Mean target height (cm)	163.66±8.11	147.20-186.00
Inability to achieve the target height	n	(%)
Female	7	6
Male	8	6.8
Total	15	12.8

SD: standard deviation

subjects whose socioeconomical level score was above the mean value could not reach THP, while 89 (76%) reached THP. It was observed that only one of 14 (12%) subjects whose socioeconomical level was below the mean value could not reach THP and 13 (11%) could reach THP. The effect of the socioeconomical level was not found to be statistically significant in reaching the target height percentile values in our subjects (p>0.05).

When the problems experienced by the subjects after discharge were examined, it was found that one subject (0.9%) had rachitis, one (0.9%) had meningitis, 26 (22%) had bronchiolitis/pneumonia. It was learned that one (0.9%) had ICH and developmental hip dysplasia operation, 14 (11%) had inguinal hernia operation and one (0.9%) had shunt operation and one subject (0.9%) received treatment with a diagnosis of septic arthritis.

Discussion

When preterm babies are examined in terms of growth properties, they reach normal percentile values until the age of two years, if there is no prenatal complication and severe congenital anomaly and good care is given after delivery. This is also true for the ones with intrauterine growth retardation (4).

In studies which assess physical growth, it is recommended that adjusted age should be used until the age of 24-36 months (4). In our study, adjusted age was used. One of the most important factors affecting growth is genetics. A normally growing child approaches the percentile appropriate for his/her genetic potential after 6-12 months, while growth in height after the age of 2-3 years shows correlation with the parental height. Therefore, the child's height is calculated over the parental height considering the difference between males and females in that population. In our study, the effect of genetic potential was examined together with the other factors using the target height formula (7).

Since it is generally accepted that each country should use its own growth curves in longitidunal growth, we used the growth curve prepared by Neyzi et al. (6) for the Turkish children. Conclusively, the number of subjects at and below the 3rd percentile was found to be 3 (2.5%), while the frequency of retardation compared with the target height was found to be 15 (12.8%). When the studies in the literature were examined, it was found that Patrick et al. (8) stated that preterm babies with low birth weight (<2 500 g) were significantly

retarded at an adjusted age compared to term babies, while another study noted that very low birth weight preterm babies had retarded growth at the adjusted age of three years (9). On the other hand, another study reported that catch-up growth occured in the first three years in the subjects who had no severe neurological, cardiac and genetic disease (10).

In our study, it was found that three subjects could not achieve catch up growth when <3 percentile (-2 SD) was considered as a criterion and two of these had hydrocephaly and one was symmetrical SGA. It was observed that 9 of 15 subjects who were retarded according to the target height percentile were AGA; 5 were symmetrical SGA and one was asymmetrical SGA. 6 (16.6%) of 37 SGA preterm babies and 7.7% of 80 AGA babies could not reach THP. Conclusively, it was observed that being AGA and SGA did not create a statistically significant difference in reaching THP. Wikland et al. (11) reported that 87% of SGA preterm babies achieved catch-up growth in the first two years and Kavuncuoğlu et al. (12) reported that head circumference was retarded in one of 125 preterm babies at the adjusted age of one year and all AGA and SGA preterm babies achieved catch-up growth independent of the gestational week. Tenovya et al. (13) noted that there was no difference in the preterm and SGA group at the age of 2 years in the longitudinal follow-up. In our study, it was found that gestational age, being AGA and SGA, gender and maternal risk factors did not create a significant difference in reaching the target height in preterm babies.

In our study, the effect of early neonatal problems on growth was also interrogated. In the literature, it has been reported that the negative effect of respiratory distress syndrome on growth occurs because of complications including BPD and/or ICH (14) and the negative effect of dexamethasone used in patients with BPD has also been noted (15). Physical and neurodevelopmental retardation was reported in patients who had necrotizing enterocolitis in long-term follow-up (16). In another study, it was emphasized that physical growth was not affected (17). In our study, early neonatal problems including sepsis, respiratory distress syndrome, BPD, NEC, ROP, hypoglycemia and follow-up in the neonatal intensive care unit were not found to be statistically significant in reaching the target height, while follow-up with mechanical ventilation, hydrocephaly following hemorrhage, presence of ICH (stage III and above) were found with a significantly high rate in the group who could not reach the target height (p<0.05) (Table 4).

Nutrition has an important role in growth of preterm babies. Sauve et al. (18) examined the relation between growth and nutrition in the first two years in preterm and term babies and reported that a marked retardation was present especially in the first year in the subjects with malnutrition and catch-up growth was achieved at the age of two years in the ones who were naurished well. In a study conducted with term babies, physical development index (PDI) was found to be 6,6 points higher and intelligence development index was found to be 2.0 points higher in the babies who received breastmilk for six months or longer compared to the ones who received breastmilk for a shorter period (19). In another study which examined the times of breast-feeding and monthly mean weight gain, it was found that the babies who gained weight to the greatest extent were fed exclusively with breastmilk for 5-6 months (20). In the study of Lucas (21) which compared the growths of SGA babies who were fed with breastmilk and formula, it was shown that breastmilk provided a faster growth compared to formula. Kavuncuoğlu et al. (12) reported that all 15 preterm babies who were exclusively breastfed achieved catch-up growth and the 25-90th percentile distribution was 75%, 69% and 75% for weight, height and head circumference, respectively, in a study in which they investigated the effect of nutrition types at the 0-4th months on growth. In our study, it was found that the subjects who did not receive breast-milk were significantly retarded, when the preterm babies who never received breastmilk or who received breastmilk for a periof of less than one month and the group who were breastfed for 4-6 months or longer in terms of reaching THP (p<0.05).

In the infancy period, support with nutritional elements in addition to breastmilk is important. When the subjects who did and did not sit at the table with their families were examined in our study, it was observed that chewing function did not develop well because of neurodevelopmental sequela in 13 subjects who could not sit at the table, could not eat at the table with the family and could not reach THP values and the difference was found to be statistically significant.

In the literature, the negative effect of smoking during pregnancy on fetal weight has been emphasized in many studies and a direct relation has been reported between daily number of cigarettes and fetal weight (22). In one study, smoking habit was found in the mother in 9.6% of VLBW babies (23). Tenovya et al. (13) reported that there was no significant difference in achieving catch-up growth between the SGA babies who were born before the 24th month and at term, when they compared 320 AGA and 31 SGA preterm babies with term babies. On the other hand, they noted that a group of SGA babies who could not achieve catch-up growth were exposed to smoking during pregnancy. In our study, growth retardation was not found in the babies whose mothers smoked during pregnancy and lactation. This was thought to be related with the low number of subjects and low amount of smoking.

Hypertensive diseases of the mother during pregnancy (eclampsia, preeclampsia) are important factors which affect both prenatal and postnatal growth and development. Since preeclampsia and eclampsia are diseases of the third trimester, asymmetrical SGA develops frequently, but studies have reported that almost all these subjects achive catch-up growth (11, 13, 24). When the children of the mothers who had and did not have hypertension during pregnancy were compared in our study, it was observed that 5 of the children of 31 hypertensive subjects did not reach THP, but there was no statistically significant difference between the two groups.

In our study, 9 subjects with a weight below the 3rd percentile were defined. Six of these could not reach THP. When the subjects were examined, it was observed that three were being followed up because of spastic tetraparesia and two were being followed up because of spastic diparesia and one subject had symmetrical SGA. One of the subjects who reached the target height percentile and whose weight was below the third percentile had spastic diparesia and one had symmetrical SGA. No etiological factor could be found in the third subject. When nutritional history was interrogated in these subjects, it was noted that they could not sit at the table with the family and/or had insufficent nutrition with solid foods. However, both groups were found to have the same mean values, when their socioeconomical levels were examined. In the light of these values, it was thought that weight problem was not an expected problem in preterm babies who had no chronic problem and who were fed sufficiently with breastmilk and with solid foods on time.

In the literature, it has been reported that socioeconomical variables including familial structure, income level, parental education levels, health states have important impact on growth (25-27). The effect of socio-

economical level was not found to be statistically significant in reaching THP for our subjects. This may be explained with the fact that the parental education level and socioeconomical level were low in our study group. However, it was observed that the parents made great efforts for development of their children, spared much time for them and did not hinder their follow-up and therapies. This may be related with the protective attitudes of the families and fear of loss arising from the problems experienced. In addition, the fact that almost all our subjects had social security provided an important opportunity in terms of follow-up, treatment and rehabilitation.

The neonatal growth curves for the 28-41st gestational week for the Turkish children prepared by Kurtoğlu et al. (28) could be used instead of Lubchenco curves in assessment of intrauterine growth in this study, but these curves were not published at the time when this study was conducted.

In our study, it was noted that the subjects who were being followed up because of chronic disease and especially who had neurodevelopmental problems were retarded in terms of both height and weight and malnutrition contributed to this retardation, since the babies were not nourished well during infancy. In addition, it was found that the babies who were never breastfed or who were breastfed for less than a month esperienced problems in achieving catch-up growth.

Conclusively, it was found that 3 preterm babies (2.5%) did not achive catch-up growth, when <3rd percentile was considered as the criterion in growth retardation in terms of height in our study. When we made the assessment according to the target height percentile, the frequency was found to be 15 (12.8%). Since this demonstrated the importance of genetic potential in growth, it was concluded that using "target height percentile" would be a safe method in preterm babies at the age of three years and older in future studies.

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