

## The Differences Between Preterm and Term Birth Affecting Initiation and Completion of Toilet Training Among Children: A Retrospective Case-Control Study

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**Purpose:** This study seeks to investigate the possibility the existence of a difference in terms of start and end dates of toilet training between term and preterm children as well as the possible determining factors.

**Materials and Methods:** This study was conducted as a 5-year retrospective case (children born preterm-(32 to <37 weeks) – and control (children born at term (>37 weeks + 1 day)) study. The data were collected with a form consisted of questions about demographic data (12 questions) and toilet training features (10 questions) through face-to-face interviews with the mothers. A chi-square test and logistic regression analysis were conducted to examine the data. Odds ratio was used as a measure of the relation between levels of the dependent variable.

**Results:** The study examined a total of 133 children including 59 preterm children and 74 children born at term including 60 (45.1%) boys and 73 (54.9%) girls. The possibility of starting toilet training at or before 24 months was found to be 6.4 times greater in full-term children than preterm children (OR = 6.493). The logistic regression analysis, which aimed at identifying any variables that might affect end date of toilet training, found that despite the tendency to consider preterm birth as a factor prolonging the duration of toilet training, the difference was not found to be statistically significant ( $P = .07$ ).

**Conclusion:** This study compared full-term and preterm children in terms of start and end dates of toilet training and found that preterm children start toilet training later than full-term children. Based on the results of the study, it is possible to say that preterm birth, gender and birth order affect start date of toilet training. However there is no difference between term and preterm babies on the end date of toilet training.

**Keywords:** toilet training; preterm birth; parents

### INTRODUCTION

While toilet training is a challenging experience for parents, it constitutes one of the most significant developmental tasks of childhood.<sup>(1-3)</sup> Smooth accomplishment of this task is critically important for both the child and the parents. A multitude of factors influences—either by enabling or obstructing—the start and achievement of the child’s toilet training. Parent-related factors include educational attainment, family sociocultural structure, income level, living environment, type of toilet, methods used, and parents’ knowledge/experience of the subject, while factors such as age, gender, physical and mental readiness, gestational age at birth, and birth weight are cited among the child-related factors.<sup>(3-7)</sup>

A review of the existing literature shows that very few studies have looked into the effect of gestational age on start and completion of toilet training.<sup>(8-9)</sup> In Drillien’s study on the growth and development of prematurely-born infants, the researcher reported on child-rearing practices and bladder control develop-

ment.<sup>(9)</sup> Toilet-training, and the age at which children became reliably dry both day and night, was related to prematurity, impairment, socioeconomic conditions, and sex. Small, prematurely-born children acquired sphincter control later than full-term-born children. The researcher also pointed out that girls were more advanced in gaining bladder control than boys. Largo et al. reported that developing bladder and bowel control is not affected by prematurity, adverse perinatal events, or mild-to-moderate neurological impairment, nor is it related to psychomotor development or socioeconomic conditions.<sup>(8)</sup>

This study seeks to answer the following questions: 1) Do preterm children and full-term children differ with respect to the start date of toilet training? ; 2) Do preterm children and full-term children differ with respect to the end date of toilet training?

### METHODS

#### Setting

This study was conducted as a 5-year retrospective case study with a control group, examining preterm children

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**Table 1.** Comparison of start date of toilet training in preterm (n=59) and full-term (n=74) children by sociodemographic characteristics

Characteristics	Start date of toilet training				$\chi^2$ p	
	Before 24 months		After 24 months			
Child* characteristics	Number (n)	Percent (%)	Number (n)	Percent(%)		
Gender						
Girl	Preterm (n=35)	12	34.3	23	65.7	9.90
	Full-term (n=38)	27	71.1	11	28.9	< .001 <sup>b</sup>
Boy	Preterm (n=24)	2	8.3	22	91.7	8.94
	Full-term (n=36)	16	44.4	20	55.6	< .001 <sup>b</sup>
Birth order						$\chi^2$ p
First-born	Preterm (n=28)	11	39.3	17	60.7	5.47
	Full-term (n=43)	29	67.4	14	32.6	0.02 <sup>a</sup>
Later born	Preterm (n=31)	3	9.7	28	90.3	9.81
	Full-term (n=31)	14	45.2	17	54.8	< .001 <sup>b</sup>
Mother's characteristics						$\chi^2$
Educational attainment						p
11 years or less	Preterm (n=34)	6	17.6	28	82.4	15.37
	Full-term (n=53)	32	60.4	21	39.6	< .001 <sup>b</sup>
More than 11 years	Preterm (n=25)	8	32.0	17	68.0	1.96
	Full-term (n=21)	11	52.4	10	47.6	0.16
Family's income level						$\chi^2$
Less income than expenses	Preterm (n=19)	8	42.1	11	57.9	3.08
	Full-term (n=20)	14	70.0	6	30.0	.08
Balanced income and expenses or more	Preterm (n=40)	6	15.0	34	85.0	14.73
	Full-term (n=54)	29	53.7	25	46.3	< .001 <sup>b</sup>
Family type						p
Nuclear family	Preterm (n=50)	10	20.0	40	80.0	17.16
	Full-term (n=69)	40	58.0	29	42.0	< .001 <sup>b</sup>
Other	Preterm (n=9)	4	44.4	5	55.6	-
	Full-term (n=5)	3	60.0	2	40.0	

\*<sup>a</sup> $p < .05$ ; <sup>b</sup> $p < .001$ 

and full-term children in a Training and Research Hospital in Turkey from March 1, 2015, through January 1, 2016.

### Subjects

The data used in the study pertained to children admitted as inpatients to the Neonatal Intensive Care Unit due to preterm birth during the one-year period between January 2010 and January 2011; these data were reviewed retrospectively, and the contact information of the patients was accessed. The cases were selected according to gestational age. Preterm birth is defined as "babies born alive before 37 weeks of pregnancy are completed". Sub-categories of preterm birth are based on weeks of gestational age: Extremely preterm (<28 weeks), Very preterm (28 to <32 weeks), and Moderate to late preterm (32 to <37 weeks).<sup>(10)</sup> The case group consisted of moderate to late preterm babies, and the control group consisted of full-term babies (>37 weeks + 1 day). The case group consisted of 59 preterm children in the then-current age group of 4-6 years with no neurological, genetic, or metabolic diseases that impacted their cognitive and motor development. Extremely preterm and very preterm babies were excluded due to common prematurity complications. The control group comprised 74 children born full-term between January 2010 and January 2011 who were hospitalized for a different reason. The control group was selected after matching for age and gender with the case group. In both groups, the children were evaluated by a doctor with a voiding dysfunction symptom score. Children with voiding dysfunction were not included in the study. The files of children in the control group were reviewed, and their contact information was accessed.

### Data collection

The contact information obtained in the file review was used to invite parents in the case and control groups to the hospital to fill out data collection forms. These forms were filled out in 10-15 minutes through face-to-face interviews with the mothers. The data collection forms were developed by the researcher through a review of the literature.<sup>(1,3,5,11-14)</sup> The form consisted of a total of 22 questions, including 12 questions about sociodemographic data (the parent's age, the child's age and gender, the parent's educational attainment and employment status, the number of children, and the family structure) and 10 questions on toilet training (child's age when toilet training started, duration of training, training methods used by parents, and any problems encountered).

### Data analysis

SPSS v22 (Statistical Package for Social Sciences) was employed to analyze the data obtained in the study. A chi-square test and a logistic regression analysis were conducted to examine the data. Numbers and percentages were used for interpretation in chi-square tables. Odds ratio was used to measure the relation between levels of the dependent variable. Throughout the analyses,  $P < 0.01$  and  $P < 0.05$  values were considered statistically significant.

The dependent variables were "start date of toilet training" and "duration of toilet training". The independent variables were the child's gender, birth order, the mother's educational attainment, her perception of income level, and family type. Though there is no specific age at which toilet training should begin, it is advised

for parents to start at 18-24 months in healthy children. (15,16) "Start date of toilet training" was defined as  $\leq$  24 months and  $>$  24 months, allowing the variable to be discrete and thus enabling logistic regression.

Ethical Considerations

Permission from Hospital's Board of Ethics and written consent from the participating mothers were obtained (1491-678-10/1539).

RESULTS

The study examined a total of 133 children, 59 preterm children and 74 full-term children, including 60 (45.1%) boys and 73 (54.9%) girls. The median age was 4.3 $\pm$ 0.8 years. All parents consist of mothers whose median age was 35.08 $\pm$ 5.63 years. In terms of mother's educational attainment, duration of education was  $\leq$ 11 years for 75 (56.4%) mothers and  $>$ 11 years for 58 (43.6%) mothers. 119 children (89.5%) lived in a nuclear family, 9 (6.8%) lived in an extended family, and 5 (3.8%) lived in a single-parent family. 39 mothers (29.3%) had lower income than their expenses, 88 (66.2%) mothers had as much income as their expenses, and 6 (4.5%) had more income than their expenses.

Table 1 compares toilet training start date in preterm and full-term children by sociodemographic character-

istics. In both genders, start of training at  $\leq$  24 months was found to be significantly higher for children born full-term ( $P < 0.001$  and  $P < 0.001$ ) than children born preterm. In terms of birth order, the number of first-born full-term children who started toilet training at  $\leq$  24 months was significantly higher than that of non-first-born children. The share of children who started training  $>$ 24 months was found to be significantly higher in the preterm group regardless of birth order ( $P = 0.02$  and  $P < 0.001$ ).

The number of full-term children of mothers with an educational attainment of  $\leq$ 11 years who started toilet training at  $\leq$  24 months was found to be significantly higher ( $P < 0.001$ ) than those of preterm children of similarly-educated mothers; this difference was not found for full-term children with mothers with an educational attainment of  $>$ 11 years ( $P = 0.16$ ). In terms of family income level, in families with income-expense balance or a higher income, the number of children who start toilet training  $\geq$  24 months was found to be significantly higher ( $P < 0.001$ ) in the preterm group than the full-term group; this difference did not exist in families with lower income ( $P = 0.08$ ). Rates of late start dates were found to be higher in preterm children living in nuclear families ( $P < 0.001$ ) (Table 1).

A comparison of toilet training completion by demo-

Table 2. Comparison of completion times of toilet training in preterm (n=59) and full-term (n=74) children by sociodemographic characteristics

Characteristics	Completion of toilet training					
	2-30 days		Longer than 30 days			$\chi^2$
		Number (n)	Percent (%)	Number (n)	Percent (%)	
Child characteristics						
Gender						
Girl	Preterm	21	60.0	14	40.0	.53
	Full-term	20	52.6	18	47.4	47.4
Boy	Preterm	17	70.8	7	29.2	.04a
	Full-term	16	44.4	20	55.6	4.05
Birth order						
First-born	Preterm	18	64.3	10	35.7	.07
	Full-term	18	41.9	25	58.1	3.41
Later born						
Preterm	Preterm	20	64.5	11	35.5	.27
	Full-term	18	58.1	13	41.9	.60
Mother's characteristics						
Educational attainment						
11 years or less	Preterm	23	67.6	11	32.4	.06
	Full-term	25	47.2	28	52.8	3.51
More than 11 years	Preterm	15	60.0	10	40.0	.27
	Full-term	11	52.4	10	47.6	.60
Family's income level						
Less income than expenses	Preterm	9	47.4	10	52.6	.23
	Full-term	11	55.0	9	45.0	.63
Balanced income and expenses or more	Preterm	29	72.5	11	27.5	6.45
	Full-term	25	46.3	29	53.7	.01a
Family type						
Nuclear family	Preterm	33	66.0	17	34.0	.07
	Full-term	34	49.3	35	50.7	3.30
Other	Preterm	5	55.6	4	44.4	-
	Full-term	2	40.0	3	60.0	-

<sup>a</sup>  $p < 0.05$

**Table 3.** Result of last step of backward logistic regression analysis for determining the variables that affect on the time to start toilet training

	B	S.E.	df	Sig.	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Birth	-1.871	.458	1	.000	.224 (.105 to .478)	.154 (.063 to .378)
Gender	1.389	.449	1	.002	2.676 (.1305 to 5.491)	4.009 (1.663 to 9.665)
Birth Order	1.357	.431	1	.002	3.416 (1.648 to 7.080)	3.886 (1.670 to 9.046)
Family Type	.806	.458	1	.078	2.182 (1.022 to 4.658)	2.239 (.913 to 5.492)
Constant-2.039	1.204	1	.090		.130	

Note: Binary Dependent variable is “the time to start toilet training” (Before 24 months; After 24 months).

graphic characteristics of children and mothers shows that the rates of toilet training lasting >30 days were significantly higher with preterm children in families with income-expense balance or with a higher income ( $P = .01$ ) and in boys ( $P = 0.04$ ) (Table 2).

A logistic regression analysis was conducted to identify any variables that might affect toilet training start date. Preterm birth, gender, and birth order were found to be statistically significant. The possibility of starting toilet training at  $\leq 24$  months was found to be 6.493 times greater with full-term children than with preterm children ( $OR=1/0.154=6.493$ ). The ratio was found to be 4 times higher in girls than boys ( $OR=4.009$ ). Similarly, the share of start dates  $\leq 24$  months was found to be 3.8 times higher in first-born children than in children with a birth order of 2 or later ( $OR=3.886$ ) (Table 3).

The logistic regression analysis also aimed to identify any variables that might affect toilet training end date; it found that, despite the tendency to consider preterm birth as a factor prolonging toilet training duration, the difference was not found to be statistically significant ( $P = 0.07$ ). Other variables were not found to have a statistically significant effect on duration (Table 4).

## DISCUSSION

This study seeks to investigate a possible difference in toilet training start and end dates between full-term and preterm children, as well as potential determining factors. Preterm birth, gender, birth order, socio-economic status, family structure, and the mother's educational attainment were found to be correlated with the start date of toilet training. A logistic regression analysis was carried out to identify the factors that had an actual effect. The analysis showed that preterm birth, gender, and birth order are the only determining factors and that all three variables delay the start date of toilet training. Drillien et al. showed that preterm birth and gender are factors that influence toilet training.<sup>(9)</sup> It is worth noting that rates of start dates >24 months is high in both genders in the preterm group. Regardless of birth order, late start was observed in the preterm group. Also, despite family socio-economic status and the child being a boy correlating with duration of toilet training, such a link was not validated by the logistic regression analysis. However, literature has shown that low socioeconomic

status has an effect on toilet training.<sup>(17)</sup>

Toilet training start date varies from one society to another. While it was common in the 1940s to start toilet training before 18 months in the US and Europe, recent studies show start dates as late as 21-36 months.<sup>(14)</sup> The American Academy of Pediatrics and the Canadian Paediatric Society recommend a child-centered toilet training approach, which starts at 18-24 months.<sup>(10,17)</sup> Mothers with a lower socio-economic status are known to have a higher risk of preterm birth.<sup>(8)</sup> This could be one factor that might influence delayed toilet training. Largo et al. showed that preterm children start toilet training earlier (<18 months) than full-term children and that they are subject to more frequent training. The same study reports that start date and intensity of the training are not related to socioeconomic status. The study also maintains that gestation week at birth does not affect bladder and bowel control.<sup>(8)</sup> Similarly, this study did not find a correlation between socioeconomic status and toilet training start date. However, as opposed to other studies, our study found that preterm children start toilet training later than full-term children. The reason could be mothers' belief that a preterm birth will result in delayed acquisition of the skill.

While one of the factors influencing toilet training start date is gender, earlier bladder and bowel control among girls is known to be linked with maturation. Additionally, a number of studies have found that both full-term and preterm girls start toilet training at a younger age than boys.<sup>(2,7,8,12,15-17)</sup> One study reports that preterm girls (both SGA (small for gestational age) and AGA (appropriate for gestational age)) start toilet training at a younger age than boys, predominantly between 12-18 months. The same study reports that gender has no impact on start date of toilet training at  $\geq 24$  months.<sup>(8)</sup> It should be noted that as in Largo's study, our study found that preterm children start toilet training >24 months regardless of gender. These findings are in line with the results of other studies found in the literature, and one reason could be faster maturational development in girls.<sup>(7,19-20)</sup>

The current study also investigated the possibility of birth order being a determining factor affecting toilet training start date. No relevant data was found in the literature. The study found that being the second child or

**Table 4.** Result of last step of backward logistic regression analysis for determining the variables that affect on the completion of toilet training

	B	S.E.	df	Sig.	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Birth	.647	.358	1	.071	1.910 (.947 to 3.851)	1.910 (.947 to 3.851)
Constant1	.240	.591	1	.036		

Note: Binary Dependent variable is “the completion of toilet training” (2-30 days; Longer than 30 days).

later delayed the toilet training start date (>24 months) in the preterm group. The reason could be mothers' belief that preterm birth may delay acquisition of toilet skills, despite their experience in child care. In the full-term group, first-born children started toilet training earlier, whereas later children did not show such a difference. The reason could be the family's desire to start toilet training at a later age for later-born siblings, either due to difficulties encountered with their first-born child or due to parents' level of experience.

Horn et al. compared toilet training start date by caregivers' educational attainment and showed that full-term children of parents with lower levels of educational attainment start toilet training earlier.<sup>(17,21)</sup> In our study, mothers with lower levels of educational attainment were also found to delay toilet training for their preterm children. However, no correlation was found between educational attainment and the timing of toilet training. The reason could be that timing of toilet training varies in different societies, or that mothers believe a preterm birth might delay acquisition of toilet skills and it would not be good to force their child to achieve this developmental task too early. However, a comparison of toilet training end dates shows that, despite a relatively shorter toilet training duration in preterm children in families with lower levels of educational attainment, the difference was not found to be statistically significant. The reason could be that later start dates result in shorter durations, due to maturation.

Family socio-economic status may be another determining factor affecting toilet training start date. Koc et al. reported in their study that parents with a higher socioeconomic status start toilet training at a later age.<sup>(22)</sup> In another study that compared full-term and preterm children, socioeconomic status was not found to impact toilet training start date in preterm children.<sup>(21)</sup> Our study did not find any correlation between socioeconomic status and the timing of toilet training, in accordance with the existing literature.

One of the limitations of this study was the use of retrospective data. This might have affected the participants' recollections of some of the details of their experience in toilet training their child. Another limitation is that toilet training methods were not taken into account. Toilet training methods are one of the important factors that affects duration of toilet training, but it was not evaluated in our study.

This study is the first study to examine the relationship between family type and toilet training. It can be argued that family structure does not have an impact on start and end dates of toilet training in preterm children.

## CONCLUSIONS

This study compared full-term and preterm children in terms of start and end dates of toilet training, and it found that preterm children start toilet training later than full-term children. Based on the results of the study, it can be said that preterm birth, gender, and birth order affect the toilet training start date. Although one may argue that being born preterm creates a tendency to shorten the duration of toilet training, no statistically significant relation was identified. More extensive research on larger groups of patients is needed to obtain reliable data on the subject. We recommend to parents or caregivers of children born preterm that gestational age at birth does not affect the occurrence of the child's

initiative nor the development of bladder and bowel control.

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## CONFLICT ON INTEREST

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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