

# Is dental treatment experience related to dental anxiety? A cross-sectional study in Lithuanian adolescents

*Vilma Brukiene, Jolanta Aleksejuniene, Irena Balciuniene*

## SUMMARY

**Objective.** The study aimed to estimate the relationship between dental anxiety and past dental treatment experience in Lithuanian adolescents and to examine a possible influence of gender and area deprivation on dental anxiety. **Material and methods.** A total of 885 adolescents in 22 randomly pre-selected areas were clinically examined and completed a questionnaire regarding dental anxiety. Dental anxiety was estimated using the Corah's Dental Anxiety Scale (DAS). Past invasive dental treatment experience was defined as the number of extracted and filled teeth. **Results.** The total mean (SD) score of the DAS was 10.07 (3.20). High levels of dental anxiety were reported in 11.3% of Lithuanian adolescents. The mean (SD) DAS score among adolescents who had no treatment experience was 9.51 (3.02), whereas adolescents who had treatment experience, had significantly higher mean (SD) DAS score, i.e. 10.25 (SD 3.23). **Conclusions.** The past dental treatment experience and dental anxiety were related in Lithuanian adolescents. Adolescents with no past invasive dental treatment experience were less anxious than those who had such experience. Girls reported higher dental anxiety than boys, while area deprivation had no effect on dental anxiety.

**Key words:** adolescents; dental anxiety; dental treatment experience; gender; urbanization.

## INTRODUCTION

Dental anxiety is historically deeply rooted in people [1]. It is generally agreed that dental fear has a complex multi-factorial aetiology, however, the latter is still not fully understood. Many factors may be involved in the development of dental anxiety: fear of pain, a lack of trust or fear of betrayal, fear of loss of control, fear of the unknown and fear of intrusion [2]. It has also been reported that children with higher dental anxiety had more dental treatment experiences and experienced treatment as more painful than children without dental anxiety [3]. The study of child dental anxiety found that the stron-

gest association was with the conditioning pathway [4], where conditioning variables "number of traumatic visits" and "dentist empathy" were responsible for 93 % of the explained variance, i.e. anxious children had experienced significantly more traumatic visits to the dentists than nonanxious children. This may demonstrate the importance of a perception of treatment experience as traumatic. Moreover, individuals with more caries tend to receive more emergency treatment [5].

Interestingly, other researchers report contradicting results: no treatment experience may be associated with more dental anxiety than some treatment experience [6]. Children who did not receive invasive treatment were significantly more anxious than those who received invasive dental treatment [7]. Authors suggested that the positive experience of invasive treatment may have a positive effect and may ameliorate dental fear via a habituation process [7, 8].

There is a general agreement that dental anxiety is acquired at a young age and especially during

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*Vilma Brukiene* – D.D.S., Assistant Professor, Institute of Odontology, Faculty of Medicine, Vilnius University, Lithuania

*Jolanta Aleksejuniene* – D.D.S., M.Sc., PhD, Department of Oral Health Sciences, Faculty of Dentistry, University of British Columbia, Vancouver, Canada

*Irena Balciuniene* – D.D.S., PhD, Hab. Dr., Professor, Director of Institute of Odontology, Faculty of Medicine, Vilnius University, Lithuania

Address correspondence to Vilma Brukiene, Zalgirio st. 115, Vilnius 08217, Lithuania  
E-mail: vilmabruk@hotmail.com

adolescence [9]. Locker et al. [10] found that prevalence of dental fear increased only marginally between the ages of 15 and 18 years. The physiological and psychological changes of puberty and the likelihood that older children receive more invasive treatments could be possible explanations of an increase in dental fear with increased age [7]. It has been reported that individuals with adolescent-onset dental anxiety were more likely to be less trusting of dentists and to be more hostile towards them than adolescents without anxiety problems [11]. Interestingly, adolescents were nine times more likely to be highly anxious of dental treatment if they thought that their dentist was unsympathetic [12].

Anxiety is the most common reason for not attending the dentist [13]. Thus, avoidance of dental treatment can be a good indicator of dental fear [1]. High levels of fear among children may also decrease seeking dental care. Reasons for avoiding dental treatment may be diverse [14]. Regarding seeking dental treatment, in the case of young children, parental decision results in a young child's visit to the dentist rather than a decision on the part of the child, while adolescents make more decisions for themselves [15]. Consequently, dental care visits in adolescents, particularly of the anxious ones may be irregular. A study of Norwegian adolescents between the ages of 12 and 18 found that 16.4% of them missed or cancelled more than 20% of their dental appointments [16].

A general conception among dentists is that individuals with dental fear have a more deteriorated dental status than dental patients without anxiety [1]. Similarly, dental anxiety in children and adolescents has been related to higher dental pathology, especially the number of missing teeth and the amount of decay [4]. This was partly explained by negative experiences related to dental treatment [17, 18]. However, other studies reported either a weak relationship between dental fear and the number of extracted teeth [19] or no difference in caries experience between high- and low-fear children [20].

A decline in caries prevalence was followed by a decreased need for restorative dental procedures in children [17]. Although dental fear has also decreased during the same period, some studies showed that despite dental caries decrease and improvements in modern dental technology reducing discomfort and pain during treatment, there remains a significant proportion of the population who report anxiety about different aspects of dental treatment [9,21]. It is likely that different causes may be responsible for the development of dental anxiety.

Higher levels of dental caries are more common in inhabitants of rural than of urban areas [22, 23] and differences in dental anxiety regarding area deprivation were also observed [4]. Higher numbers of anxious children were found to live in deprived areas compared to non-deprived areas [4].

Rural children in Lithuania had significantly more teeth with primary caries and more teeth which needed to be extracted than urban children [24]. This may suggest that the treatment of children in rural areas is insufficient. It is important to consider that there is an uneven distribution of dentists in Lithuania since the majority of them are concentrated in big cities. It has been suggested that the untreated severe tooth decay in rural adolescents is largely a consequence of avoidance and is not related to availability and access to dental care [25]. It has also been reported that in the non-deprived areas more children attended dentist asymptotically, whereas those in deprived areas tended to seek dentist when a dental problem occurred [26]. The question can be raised, whether dental treatment experience and dental anxiety in Lithuania will depend on area deprivation.

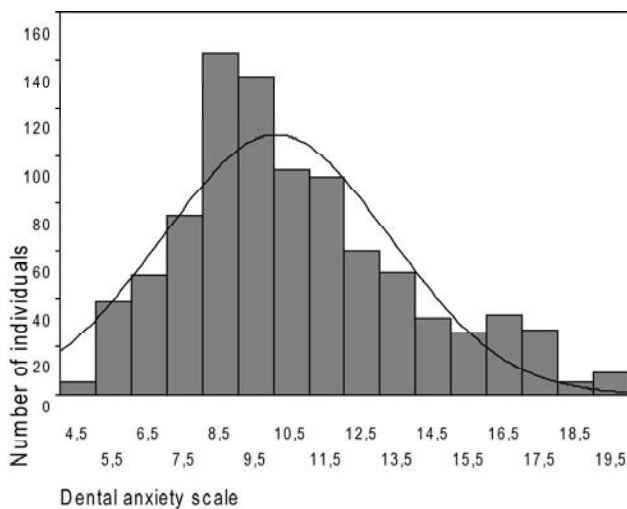
Different cultures and health care systems may influence the development of child dental fear differently, thus specific information from each country is needed. Dental caries is still highly prevalent among Lithuanian adolescents [22, 24, 27]. Causes of dental fear among adolescents were studied in a sample of adolescents residing in Vilnius, the capital city of Lithuania [28], but no relationship between dental fear and dental decay was demonstrated. How dental anxiety relates to dental treatment experience in Lithuania is still unknown.

The hypothesis of the present study was that more invasive dental treatment relates to higher anxiety, even when controlling for a gender, urbanization and other background factors. As suggested by other researchers [6, 7], children without any dental treatment experience were expected to have higher dental anxiety than children with some dental treatment experience. Thus, the aims of the present study were: 1) to estimate the relationship between dental anxiety and past dental treatment experience in Lithuanian adolescents and 2) to examine a possible influence of gender and area deprivation on dental anxiety.

## MATERIAL AND METHODS

### *Sample*

The study was performed in 2003-2005 after receiving the permission from the Ministries of



**Fig.** The distribution of dental anxiety scores in Lithuanian adolescents

Health and Education in Lithuania. The sampling scheme was as follows. Lithuania is divided into 10 geographical districts. In each of the 10 districts, two areas, one urban and one rural area, were chosen randomly. One district in the Western part of the country contains increased amounts of fluoride ( $F > 1.0$  ppm) in the drinking water. In order to secure enough participants from the high fluoride district, one urban and one rural area from the high fluoride district were added; thus the total sample consisted of adolescents from 22 areas. In each of these areas, one secondary school was chosen randomly. In each of these schools, two or three classes of 15-16 year-old children were invited to participate in the examination. Children and their parents were asked to sign informed consent forms.

Only children who had both signed forms were included into the study. The response rate was very high: only 4 adolescents did not give consent to participate in this study. A minimum of 32 and maximum of 50 individuals from each school were examined. Because of mandatory school attendance until 16 years of age, the present sample can be considered to be a representative sample of 15-16-year-old Lithuanians.

#### *Clinical data collection*

The data for the present study were collected following the general principles for basic oral health surveys of the World Health Organization [29]. Clinical examinations were performed by one examiner (VB). A portable halogen lamp was used as a light source and each subject was examined lying on a simple school table using a caries explorer and plain mouth mirror for the clinical examinations. The intra-examiner agreement was estimated by means of the Kappa index calculated between the double clinical recordings of 50 participants taken three days apart. A Kappa value of 0.89 was considered satisfactory.

#### *Self-assessments of dental anxiety*

Dental anxiety was estimated using the Corah's Dental Anxiety Scale (DAS) [30]. This scale measures reactions to four different dental treatment situations: 1) before attending the dental surgery; 2) waiting in the dental operator; 3) sitting in the dental chair; and 4) undergoing treatment. Each question has five pre-structured answers evaluated on a scale from one to five; one being a level of no anxiety and five being the maximum level of anxiety

**Table 1.** The operationalization of the independent variables

Independent variable	Categories	Categories used in bivariate and multivariate analyses
Gender	1) boys 2) girls	1) boys 2) girls
Urbanization	1) urban 2) rural	1) urban 2) rural
Past invasive treatment experience	1) number of extracted teeth 2) number of filled teeth	
Time of the last dental visit	1) less than 6 months ago 2) during the last year 3) more than 1 year ago 4) never	1) visit in the last year 2) no visit in the last year
Reason for the last visit	1) check-up 2) dental pain or problem	1) check-up 2) dental pain or problem
Satisfaction with dentist's attention	1) very satisfied 2) satisfied 3) dissatisfied 4) very dissatisfied	1) satisfied 2) dissatisfied

**Table 2.** Dental anxiety (DAS) and past invasive dental treatment experience between gender and urbanization groups

Variable	N	DAS	Number of filled teeth	Number of extracted teeth
		Mean ± SD	Mean ± SD	Mean ± SD
Boys	350	9.04 ± 2.68	2.66±2.88	0.07±0.30
Girls	531	10.76 ± 3.34	3.59±3.45	0.12±0.40
Urban	439	9.87 ± 3.17	2.86±3.11	0.08±0.32
Rural	446	10.28 ± 3.22	3.57±3.39	0.12±0.4

**Table 3.** Sample distribution according to the latest dental experience and mean DAS scores

Variable	Number of adolescents	%	DAS	95 % CI
			Mean±SD	
<b>Time of the last dental visit</b>				
• visit in the last year	545	61.6	9.86±3.08	[-1.00; -0.12]
• no visit in the last year	339	38.3	10.42±3.35	
<b>Reason for the last dental visit</b>				
• check-up	347	39.2	9.66±3.01	[-1.09; -0.23]
• dental pain or problem	524	59.2	10.32±3.26	
<b>Satisfaction with dentist's attention</b>				
• satisfied	727	82.1	9.9±3.08	[-1.59; -0.47]
• dissatisfied	152	17.2	10.93±3.58	

Thus, the total in the DAS scale presented a minimum score of 4 (no anxiety) and the maximum score of 20 (extremely high anxiety). The language of administration of DAS questionnaire was Lithuanian, translated by the authors. In order to secure the reliability and validity of the translation of DAS,

Lithuanian version was back-translated by another native Lithuanian person, fluent in both Lithuanian and English and not involved in the study, and then compared with the original form.

Regarding the DAS information, the responses of 12 individuals had to be excluded because their

**Table 4.** Sample distribution according to the latest dental experience in different gender and urbanization groups

Variable	Boys (%)	Girls (%)	Urban (%)	Rural (%)
<b>Time of the last dental visit</b>				
• visit in the last year	56.3	65.5	54.4	68.6
• no visit in the last year	43.4	34.5	45.3	31.4
<b>Reason for the last dental visit</b>				
• check-up	39.7	38.7	37.1	41.3
• dental pain or problem	58.0	60.2	60.6	57.8
<b>Satisfaction with dentist's attention</b>				
• satisfied	81.7	82.5	85.2	79.1
• dissatisfied	17.4	17.0	14.4	20.0

**Table 5.** Multiple linear regression analysis of dental anxiety (DAS) and different factors

Independent variables	DAS	
	Beta	95 % CI
Gender	0.25	[1.23; 2.07]
Number of extracted teeth	0.06	[-0.08; 1.03]
Number of filled teeth	0.09	[0.02; 0.15]
Time of the last dental visit	0.12	[0.32; 1.19]
Reason for the last dental visit	0.06	[-0.003; 0.84]
Satisfaction with dentist's attention	0.12	[0.48; 1.55]
Adjusted R <sup>2</sup> = 0.10 (P = 0.000)		

answers were not complete and five more questionnaires could not be analyzed since they lacked information about gender.

Other studied factors were: gender, urbanization, past invasive dental treatment experience and factors related to the latest dental experience, such as time of the last dental visit, reason for the last dental visit and satisfaction with dentist's attention. Past invasive dental treatment experience was defined as the number of extracted and filled teeth. The operationalization of the study variables is presented in Table 1.

#### *Data analysis*

The statistical data analysis was done using the Statistical Package for the Social Sciences (SPSS, Chicago, IL, USA). The following statistical analyses were performed: frequency estimations and independent sample t test. The association between dental anxiety and related factors such as gender, urbanization, past invasive treatment experience and the latest dental experience was tested by Pearson's Correlation Coefficient. The means of anxiety scores between groups were compared by independent sample t test and by comparing only two groups at a time. The linear multiple regression analysis was performed using dental anxiety as dependent variable and gender, urbanization, past invasive treatment experience and the latest dental experience as independent variables. The level of statistical significance was considered at  $P < 0.05$ .

## RESULTS

A total of 885 15-16 year-olds were examined. The mean (standard deviation) DAS score was 10.07 (3.20). The lowest DAS score of 4 (no anxiety) was reported by only 5 (0.6%) participants and the highest DAS score of 20 (extremely high anxiety) was reported by 4 (0.5%) participants. Of all, 11.3% of adolescents had DAS score 15 or more, what indicated that they experienced high levels of dental anxiety [31]. The distribution of participants in regards to the DAS scores is illustrated in Figure 1.

Of all, 206 (23.3%) adolescents had no treatment experience, i.e. they did not have filled or extracted teeth. The mean (SD) DAS score among these individuals was 9.51 (3.02). In comparison, adolescents who had treatment experience, had significantly higher mean (SD) DAS score, i.e. 10.25 (SD 3.23) (95% CI [0.25; 1.24]).

The findings regarding the relationship between dental anxiety scores and past invasive dental treat-

ment experience in gender and urbanization groups are illustrated in Table 2. Dental anxiety differed significantly between boys and girls (95% CI [-2.15; -1.30]). Regarding urbanization groups, rural 15-16-year-olds reported slightly higher DAS scores than their urban counterparts, but this difference was not statistically significant (95% CI [-0.83; 0.02]).

The differences in mean numbers of filled teeth were statistically significant between gender groups as well as between urbanization groups (95% CI [-1.36; -0.49] and 95% CI [-1.14; -0.28] respectively), whereas mean numbers of extracted teeth differed significantly only between urbanization groups (95% CI [-0.10; 0.00]).

Table 3 shows the distribution of adolescents regarding different aspects of their latest dental experience. For example, children, who did not visit a dentist in the last year, those, whose last dental visits were because of pain or other problem and the ones who were dissatisfied with dentist's attention reported significantly higher dental anxiety.

The findings related to the latest treatment experience in different gender and urbanization groups are presented in Table 4. Boys and girls as well as urban and rural adolescents were similar regarding the reported reason for the last dental visit and regarding their satisfaction with their dentist's attention. Regarding the regularity of dental visits, girls and rural adolescents were more likely to have a dental visit in the last year than boys or urban participants.

Regarding bivariate relationships between dental anxiety and a number of related factors, the DAS scores correlated significantly with gender ( $P=0.000$ ), the number of filled teeth ( $P=0.004$ ), the number of extracted teeth ( $P=0.015$ ), the time of the last dental visit ( $P=0.012$ ), the reason for the last dental visit ( $P=0.003$ ) and with satisfaction with dentist's attention ( $P=0.000$ ).

The joint impact of factors regarding variation in DAS scores was estimated by a linear multiple regression analysis (Table 5). In multivariate analysis, factors "gender", "number of filled teeth", "time of the last dental visit" and "satisfaction with dentist's attention" related significantly to dental anxiety, whereas factors "number of extracted teeth" and "reason of the last dental visit" did not relate significantly to dental anxiety.

## DISCUSSION

The study investigated the relationship between dental anxiety and past dental treatment experience

in Lithuanian adolescents. The results showed that past dental treatment experience measured as the number of filled teeth and the number of extracted teeth was related to dental anxiety. Generally in the existing literature, inconsistent findings have been reported regarding dental anxiety and treatment experience. For example, in some studies patients without dental anxiety were reported to have significantly more filled surfaces compared to the ones with anxiety [1], while in other studies no relationship between dental anxiety and the number of fillings in different children age groups was found [4, 19]. The present study reported a significant relationship between number of dental restorations and dental anxiety and this relationship was maintained even when controlling for gender and other background factors.

Regarding another indicator of dental treatment experience, namely the number of extracted teeth the picture was different. In spite of the significant bivariate association between the number of extracted teeth and dental anxiety score, in multiple regression analysis the number of extracted teeth did not relate significantly to anxiety. It is important to note that extractions were uncommon among 15-16-year-old Lithuanians, consequently the present study might have insufficient information regarding dental extractions to test thoroughly the possible relationship between dental treatment experience and dental anxiety.

Of all, 11.3% of 15-16-year-olds were highly anxious regarding dental treatment, which is comparable to other studies from Eastern and Western Europe [3, 9], although the present study reported higher dental anxiety (mean DAS score 10.1) than a previous Lithuanian study (mean DAS score 9.3) [28]. This difference may be explained by sampling differences. The present study was a national study and included adolescents from 22 different geographical areas while the previous Lithuanian study evaluated levels of dental anxiety only in one city, namely Vilnius which is the capital of Lithuania.

The present study did not support the findings from other studies [6, 7], reporting that children without any dental treatment experience have higher dental anxiety than those who experienced dental treatment. Interestingly, the Lithuanian pattern was the opposite to the aforementioned studies, i.e. Lithuanian children who had no dental treatment were less anxious than children who had invasive dental treatment experience.

Previously it has been suggested that patient's perception about dentist may influence the develop-

ment of dental anxiety. This proposition was confirmed by the findings of the present study where Lithuanian adolescents with higher DAS scores were more dissatisfied with their dentist's attention. It is also important to consider that regarding higher dental anxiety, satisfaction with dentist's attention was a stronger contributing factor than dental treatment experience.

Another finding of the present study that girls were more anxious than boys is in accordance with other studies [3, 9, 10, 14, 28, 32]. In multiple regression analysis, gender was the strongest contributing factor to explaining dental anxiety. Further studies are needed to understand the reasons of higher dental anxiety in Lithuanian girls compared to boys. One possible hypothesis might be that appearance of teeth is one of the greatest concerns of adolescent girls, therefore they tend to seek professional dental care more regularly than boys [33, 34]. It can also be speculated, that girls, having significantly higher mean number of filled teeth than boys experienced more invasive dental treatment than boys, consequently become more fearful. Our results that past invasive dental treatment experience was positively related to dental anxiety may support this explanation. Another reason that adolescent boys did not admit to being anxious has also been suggested [6]. This might relate to difference in gender roles where females are more willing to express and report feelings of anxieties than males [1]. Thus, the possibility that gender differences in dental anxiety reported in the present study are at least partly due to differences related to different gender roles, can not be excluded. Interestingly, in countries with different cultural modulation, no statistical relationship between gender and dental anxiety was reported [35].

In the present study, the expected higher dental anxiety followed by higher avoidance of dental treatment in rural adolescents was not confirmed. Moreover, given that the accessibility to dental care in Lithuanian rural areas is worse than in urban areas, the finding that 15-16-year-olds living in rural areas had more fillings than urban adolescents was surprising. In studied urban areas dentist-to-patient ratio was almost double the ratio in rural areas, namely 7.05 dentists per 10 000 inhabitants versus 4.47 dentists per 10 000 inhabitants. This might mean that despite the uneven distribution of dentists in Lithuania, with a predominant number of them residing in big cities, and despite the economical deprivation experienced by rural dentists, the rural dentists do more restorative work in adolescents than urban dentists.

Another hypothesis that the avoidance and delay of dental treatment until problem occurs causes severe untreated tooth decay in rural children was not confirmed by this study. The similar percent of urban (37.1 %) and rural (41.3 %) participants reported "check-up" as the reason for the last dental visit, and more adolescents from rural areas (68.6 %) visited their dentists in the last year than those from urban areas (54.4 %).

Some limitations of the present study have to be considered. Due to ethical reasons, the study excluded four adolescents who did not deliver informed consent forms, but a small number of non-responders should not influence the conclusions. Another disadvantage is the cross-sectional design of the present study which makes causal interpretations

difficult, if not impossible, i.e. to determine if the observed relationship between dental anxiety and treatment experience in Lithuanian adolescents is causal.

## CONCLUSIONS

1. The past dental treatment experience and dental anxiety were related in Lithuanian adolescents.

2. Adolescents with no past invasive dental treatment experience were less anxious than those who had such experience.

3. Girls reported higher dental anxiety than boys, while area deprivation had no effect on dental anxiety.

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