# ORIGINAL ARTICLE

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# Dental anxiety and symptoms of general anxiety and depression in 15-year-olds

Abstract: Objectives: The objective of the study was to analyse the relationship between dental anxiety and symptoms of general anxiety and depression among 15-year-old individuals. Methods: The sample analysed included 221 randomly selected 15-year-old individuals living in the city of Jönköping, Sweden. One guestionnaire captured sociodemography and dental history, while dental anxiety was assessed by the Dental Fear Survey (DFS) and symptoms of general anxiety and depression by the Hospital Anxiety and Depression Scale (HADS). Results: About 6% of the adolescents were classified as dentally anxious. Symptoms of general anxiety and depression were significantly correlated with dental anxiety in both the bivariate and multivariate analyses. The latter analyses were adjusted for gender and previous painful experiences of dental care. Individuals with high dental anxiety showed general anxiety scores on a clinical level (mean = 9.8, SD = 4.3). *Conclusions:* Symptoms of general anxiety and depression were shown to be significantly correlated with dental anxiety among 15-year-old individuals.

**Key words:** adolescents; cross-sectional; dental anxiety; depression and anxiety; epidemiology

# Introduction

Dental anxiety (DA) in children and adolescents is a common condition and epidemiological studies have shown a prevalence of around 6-20% independently of culture and country (1-6). The terms dental fear and dental anxiety are often used synonymously; in this paper, we use the term dental anxiety. With respect to dental anxiety, correlations have been found between children and their parents (7, 8) and the condition is more common among girls (9). It has been suggested that dental anxiety could contain both exogenous and endogenous constituents (10), which was supported by the results of Locker, Thomson and Poulton (11). The exogenous components related to dental anxiety are acquired as a function of direct or vicarious experience (12). The endogenous components could refer to dental anxiety as part of more complex psychological disorders, such as multiple phobias, other anxiety and mood disorders and other psychiatric diagnoses (13, 14). Previous results have shown that dental anxiety is related to general anxiety (2, 15, 16) and high levels of general fearfulness (17). In a population of young adults, it was seen that high rates of psychological disorders were characteristic of those with high levels of dental anxiety and that psychological disorder was related to the maintenance of dental anxiety over time (14). These findings suggest that some people may have a constitutional vulnerability to anxiety and/or mental health problems (13, 14, 18).

A study that examined the relationship between dental anxiety and depression and anxiety found that both psychological and conditioning variables contributed to the development of dental anxiety in a population of young adults (11). The strongest predictor for the onset of dental anxiety was the avoidance of dental care (11), which can be explained, in part, by the 'vicious circle' of dental anxiety proposed by Berggren in 1984 (19). There is a lack of cohort studies of 15-year-olds with regard to dental anxiety and other psychological disorders.

The objective of the study was to analyse the relationship between dental anxiety and symptoms of general anxiety and depression among 15-year-old individuals.

## Material and methods

### Study sample and procedures

This cohort study was a cross-sectional study based on a sample of adolescents selected by a random two-shape cluster method. The participants, 15 years of age, were residents in the municipality of Jönköping, Sweden. At the time of the study, there were ten local secondary schools in Jönköping, from which twelve classes in four schools were randomly chosen. The chosen schools had similar socioeconomic profiles according to area and type of housing. This resulted in a sample including 263 adolescents, equivalent to 15% of the total number of 15-yearolds in the city of Jönköping, Sweden, in 2004. The schools were visited by one of the authors (MH) and a dental hygienist student. The principal at each school gave his/her permission to the aforementioned persons to meet the randomly selected classes and students in their classrooms. At the time of implementation of the study, 42 individuals were absent from the classrooms. These students were participating in other activities or reported as being absent. The attending students were asked to take part in the study and were informed that their participation was fully voluntary. All the students present agreed to participate. The questionnaires were completed in the classrooms. The study met the regulations of the Swedish research ethical law and the Helsinki declaration.

#### Measures

The questionnaire on background variables included variables of gender, possible immigrant background (yes or no), parental educational level (primary, secondary and college/university), satisfaction or dissatisfaction with tooth appearance (very satisfied, fairly satisfied, neither satisfied nor dissatisfied, fairly dissatisfied, very dissatisfied), the student's self-perceived dental health (very good, good, bad, very bad), pain experience at the last dental appointment (no pain, a little, yes much), previous pain experience during dental care treatment (no never, occasionally, several times).

The degree of dental anxiety was measured with the Swedish version of the Dental Fear Survey (DFS), containing 20 items measuring the level of dental anxiety (20), which is the preferred clinical tool for this purpose (21). The instrument has been shown to have good stability, high reliability and acceptable validity (20, 22), and the DFS has been used in Scandinavia for several years (4, 23) and in international epidemiological studies for over 30 years. The DFS covers the following domains of dental anxiety: avoidant behaviour, physiological reactions and fear of specific situations and objects. The answers to the questions are scored on a fivepoint Likert scale from 1 (no anxiety) to 5 (high intensity of anxiety). Based on the total sum of points, this gives a score between 20 and 100. A DFS score of 60 points or more has been assessed as dental anxiety (4, 24). The internal consistency of the DFS scale of the sample in this study was analysed and resulted in a Cronbach's alpha coefficient of 0.94.

The Swedish version of the Hospital Anxiety and Depression Scale (HADS) was used to measure general anxiety and depression. The HADS is a self-report rating scale and has been developed for screening for clinically significant anxiety and depression in non-psychiatric patients (25). It is composed of 14 items divided into two subscales, with seven items in each subscale. The items focus on cognitive and emotional issues of general anxiety and depression; thus, the subscales generate individual points for anxiety (Anxiety subscale, HADS-A) and depression (Depression subscale, HADS-D). Each item is measured on a 4-point Likert scale, ranging from 0 to 3, giving total points varying from 0 to 21 on each subscale. A score on each subscale above seven indicates the presence of clinical significant distress, according to the following cut-off: 0-7 (normal), 8-10 (mild), 11-14 (moderate) and 15-21 (severe) (25). The HADS has been found to be a reliable instrument for identifying anxiety disorders and depression in populations (26-28) and appears to differentiate well between anxiety and depression (25, 29). The reliability also applies to adolescents and its brevity makes it useful for screening and in clinical settings with adolescents (30). Each subscale was examined for internal reliability and resulted in Cronbach's alpha coefficients of 0.78 for HADS-A and 0.56 for HADS-D, which indicated a moderate to acceptable reliability.

#### Statistics

All analyses were performed using the IBM Statistical Package for the Social Sciences (SPSS) Statistics, version 19 (IBM Corp., Armonk, NY, USA). The *t*-test was used to analyse differences between groups on variables measured on a continuous scale (HADS, DFS). For skewed distributions implicating non-normality, the Mann–Whitney *U*-test was applied. The chi-square test or Fisher's exact test were used for categorical variables. Pearson's correlation coefficient was used to analyse relationships between continuous variables. Logistic and linear regression analyses were applied to predict dental anxiety and reveal the amount of variance explained in the models. Pairwise exclusion was used for missing data; hence, the number of observations varies in the respective analyses. Cronbach's alpha was used for the analysis of internal reliability. The chosen significance level was P < 0.05.

## Results

Of the total sample (n = 263), 16% (n = 42) of the students were absent from the classroom. The remaining 221 students (84%) who were present in the classrooms responded to the survey; 105 girls and 116 boys. Sixty students (27%) reported an immigrant background. When asked about their parent's education, 29 (13%) of the students responded that their mother had primary education at the most, 90 (41%) reported secondary education and 88 (40%) a college/university education. The education figures for the existing fathers were 39 (18%), 92 (42%) and 71 (32%), respectively.

A majority (n = 179, 81%) were fairly satisfied or very satisfied with their tooth appearance, while as many as 210 students (95%) felt that their dental health was good or very good. Eighty students (36%) reported they had experienced pain at some level at the last dental visit. More than half of the students reported having experienced one or more painful dental treatments.

#### **Dental anxiety**

Of the total number of participating students (n = 221), 216 respondents completed the DFS questionnaire and, of those, 14 students (6.5%) were classified as having dental anxiety (DFS  $\ge$  60). The mean DFS score for the 216 students was 34.2 (SD = 14.9).

#### Anxiety and depression

Missing values for any of the two subscales in HADS were seen in five (2%) of the 221 completed forms, with one missing value on HADS-A and four on HADS-D. The mean score for the whole group regarding HADS-A was 6.8 (SD = 3.9) and 4.8 for HADS-D (SD = 3.0). The median HADS-A score was 7.0 (range 18) and for HADS-D 4.0 (range 16). When the group was divided by gender, the mean scores of the two subscales changed with higher mean values for girls than boys (Table 1). The difference regarding HADS-A was significant and the mean value for the girls indicated mild general anxiety (>7).

# Table 1. Mean and median DFS, HADS-A and HADS-D scores for boys and girls

	Gender	п	Mean	Median	SD
DFS*	Boys	111	29.9	24.0	11.9
	Girls	93	38.7	35.0	16.2
HADS-A*	Boys	115	5.2	5.0	3.3
	Girls	105	8.5	8.0	3.8
HADS-D	Boys	113	4.5	4.0	2.8
	Girls	104	5.1	4.0	3.2

\*P < 0.001.

HADS, Hospital Anxiety and Depression Scale; DFS, Dental Fear Survey; HADS-A, anxiety (HADS); HADS-D, depression (HADS).

One-way analyses of variance were conducted to explore the impact of the respective parents' educational level on HADS-A and HADS-D. There was a statistically significant difference in HADS-D with regard to mother's education (F = 5.3, P = 0.006) as well as father's education (F = 4.1, P = 0.017). Post hoc comparisons using the Tukey test indicated that the mean score (HADS-D) for those with mothers with secondary education (M = 5.4, SD = 3.3) was significantly different from those with mothers with a college/university education (M = 4.0, SD = 2.6), and the mean score (HADS-D) for those with fathers with primary education only (M = 5.7, SD = 3.0) was significantly different from those with fathers with a college/university education (M = 4.0, SD = 2.6).

No statistically significant differences could be identified with regard to having immigrant status or not. Table 2 shows the results when the answers to some of the other background issues were dichotomised. With respect to HADS-A, statistically significant differences could be identified both for *satisfaction with tooth appearance* (t = 2.17; P < 0.04) and *perceived dental health* (t = 2.19; P < 0.03). Similar differences could also be seen for *pain at the last dental visit* (t = 4.06; P < 0.001) and *previous painful dental treatment* (t = 2.82; P < 0.006). There was a positive correlation coefficient between HADS-A and HADS-D (r = 0.31, P < 0.0005).

#### Dental anxiety, HADS and background variables

The students with dental anxiety were found to have higher mean values on both the HADS-A and the HADS-D, compared with individuals without dental anxiety (Table 3). The difference concerning symptoms of general anxiety (t = 3.0; P = 0.003) was found to be statistically significant. The relationship between the sum of the DFS and the HADS-A and HADS-D was investigated (Table 4). This revealed that the DFS scores were significantly correlated with both subscales, HADS-A (positive) and HADS-D (positive), for the whole group as well as for boys. The DFS scores for girls were only significantly correlated with symptoms of general anxiety.

Logistic regression was performed to assess the impact of symptoms of general anxiety and depression on the likelihood that the respondents would report dental anxiety. The full model was statistically significant;  $\chi^2 = 8.91$ ; P < 0.012, indicating that the model was able to differentiate between respondents with and without dental anxiety. The model as a whole explained between 4% (Cox and Snell R-square) and 11% (Nagelkerke R-square) of the variability in dental anxiety, classifying 93% of the cases correctly. As shown in Table 5, only HADS-A made a statistically significant contribution to the model.

Hierarchical multiple linear regression was used to assess the ability of the two HADS subscales to predict levels of dental anxiety, using the DFS as a continuous scale after controlling for the influence of other independent variables. Preliminary analyses were performed to ensure no violation of the assumption of multicollinearity. Table 6 shows the result of this regression analysis when some of the background data

Table 2.	Mean values	concerning HA	DS-A and H	HADS-D with	respect to	background data

		Satisfied or dissatisfied with tooth appearance		Perceived dental health		Pain at the last dental appointment		Previous pain experiences during dental treatment	
		Dissatisfied	Satisfied	Bad	Good	No	Yes	No	Yes
HADS-A	n	41	179	11	209	140	80	89	130
	Mean	8.1	6.5	9.3	6.7	6.0	8.2	5.9	7.4
	SD	3.8	3.9	3.3	3.9	3.8	3.7	3.7	4.0
HADS-D	п	41	176	11	206	138	79	87	128
	Mean	5.5	4.6	5.8	4.7	4.6	5.1	4.5	5.0
	SD	3.4	2.9	2.3	3.1	3.0	3.1	2.9	3.1

HADS, Hospital Anxiety and Depression Scale; HADS-A, anxiety (HADS); HADS-D, depression (HADS).

Table 3. Mean values concerning HADS-A and HADS-D with respect to dental anxiety defined as a DFS score  $\geq$  60

	Dental anxiety	п	Mean	SD
HADS-A*	Yes	14	9.8	4.3
	No	201	6.6	3.8
HADS-D	Yes	14	6.1	3.2
	No	199	4.7	3.0

\*P < 0.003.

HADS, Hospital Anxiety and Depression Scale; HADS-A, anxiety (HADS); HADS-D, depression (HADS).

Table 4. Correlation coefficients between the sum of the DFS and the HADS subscales

		HADS-A	п	HADS-D	n
Total	DFS	0.40***	215	0.24***	213
Girls	DFS	0.26*	101	0.12	101
Boys	DFS	0.36**	114	0.36**	112

\*\*\**P* < 0.0005.

\*\*P < 0.001.

\**P* < 0.01.

HADS, Hospital Anxiety and Depression Scale.

Table 5. Logistic regression predicting likelihood of dental anxiety

	Beta	P-value	Odds ratio	95% C.I.
HADS-A	0.184	0.015	1.20	1.04–1.39
HADS-D	0.070	0.417	1.07	0.91–1.27

were entered at Step 1, explaining 29% of the variance in dental anxiety (Model 1). After the introduction of the two subscales (HADS-A and HADS-D) at Step 2, the total variance explained by the model as a whole was 34% (F = 12.27; P < 0.0001) (Model 2). Symptoms of general anxiety and depression explained an additional 6% of the variance in dental anxiety, after controlling for the different background data ( $R^2$  change = 0.055, F change = 7.89; P = 0.001). In the final model, gender, previous pain, symptoms of general anxiety and depression were statistically significant. Table 6. Hierarchical multiple linear regression analysis regarding the participants' background data and anxiety (HADS-A) and depression (HADS-D). The dependent variable is the DFS sum of scores

Mo	odel	Standardized beta	<i>t</i> -value	<i>P</i> -value
1	Gender	-0.25	-3.96	0.000
	Immigrant background	-0.06	-1.01	0.314
	Mother's education	-0.04	-0.61	0.541
	Father's education	0.03	0.47	0.641
	Pain at the last dental appointment	0.34	5.39	0.000
	Previous pain experiences during dental care treatment	0.21	3.40	0.001
2	Gender	-0.18	-2.65	0.009
	Immigrant background	-0.05	-0.76	0.449
	Mother's education	-0.02	-0.33	0.743
	Father's education	0.06	0.87	0.387
	Pain at the last dental appointment	0.30	4.81	0.000
	Previous pain experiences during dental care treatment	0.20	3.23	0.001
	Anxiety	0.18	2.61	0.010
	Depression	0.14	2.15	0.033

## Discussion

The objective of the study was to analyse the relationship between dental anxiety and symptoms of general anxiety and depression among 15-year-old individuals. Both symptoms of general anxiety and depression were significantly correlated with dental anxiety after controlling for other potential risk factors.

The mean values, both for symptoms of anxiety and depression, may be regarded as normal (non-clinical) following the established cut-off points, but are higher than the normative data for Swedish adolescents (31), whereas the levels are closer to the normative data reported from the UK (30) and from a large community sample in Hong Kong (32). Differences in the levels of symptoms of anxiety and depression could be due to different study designs, samples and methods of administration. The normative study by Jörngården *et al.* (31) included 180 subjects in the age group 13–15 years and examined the effect of different administration methods of HADS (by mail or telephone). Levels of anxiety and depression are expected to be higher in older adolescents, and as the 15-year-olds are not reported separately in Jörngården et al. (31), age differences could explain, in part, the difference in results. Also, the method of distribution differs between the study by Jörngården et al. (31) and the present study, while the UK study (30) used the same classroom design as this study. Obviously, more research on general anxiety and depression in different age groups using HADS is needed. The girls reported more symptoms of anxiety, as observed in the previous studies (11, 25). The mean score for the girls in the present study is just above the limit for a clinical level of general anxiety. The results showed statistically significant differences in reported symptoms of depression related to mother's education as well as for father's education. Despite reaching statistical significance, the actual differences in mean scores between the groups were quite small. The positive correlation found between symptoms of general anxiety and depression can be considered to be moderate, but is weaker than the results from Chan et al. (32), which reported a correlation coefficient of 0.48 between the two subscales.

Students who were classified as having dental anxiety reported more symptoms of general anxiety and depression. This result can be compared with a study conducted among young adults, which showed that the individuals who were dentally anxious were more likely than the non-anxious individuals to be diagnosed with one or more psychological disorders (14). The above results, together with the result that the DFS scores were significantly correlated with both subscales, the HADS-A and the HADS-D, and the results from the logistic regression analysis performed, suggest – as in a previous study (11) – that psychological variables are associated with dental anxiety. In the present study, symptoms of general anxiety as well as depression was more strongly related to dental anxiety for boys than for girls, which was an unexpected result that merits further examination.

In the group with dental anxiety, there was a proportionally larger group who reported having been exposed to painful treatments than in the group without dental anxiety. Several studies have shown that the experience of painful dental treatments could increase the risk of developing dental anxiety (3, 4, 33, 34). The hierarchical multiple regression analysis that was performed in the present study revealed a result that pointed in the same direction. The results of the analysis also showed that gender, previous pain, symptoms of general anxiety and depression were statistically significant, which contribute to the hypothesis that, in addition to psychological variables, conditioning variables also contribute to the development of dental anxiety in adolescents, a result previously seen in another study (11).

A limitation of the study is the cross-sectional design that does not permit conclusions relating to causality. The strengths of the study are the population-based randomized sample of considerable size from a moderately large city and the small number of drop-outs. To conclude, symptoms of general anxiety and depression were shown to be significantly correlated with dental anxiety among 15-year-old individuals.

## Conflict of interest

The authors report no conflicts of interest.

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