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Psychological distress and anxiety compared amongst dental patients- results of a cross-sectional study in 1549 adults

Alexander Zinke¹, Christian Hannig² and Hendrik Berth^{1*} 

Abstract

Background: This study aimed to identify anxiety in dental patients visiting a dental clinic using the Dental Anxiety Scale, their level of psychological distress using the Brief Symptom Inventory-18 and therefore identifying a correlation between these groups as well as their gender and age.

Methods: An adult sample of $N = 1549$ patients (865 females, 779 males) was examined over the course of three years using the Brief Symptom Inventory-18 to evaluate psychological distress and the Dental Anxiety Scale to determine anxiety before dental treatment. Evaluations were conducted according to age and gender.

Results: There was no correlation between different age groups of the sample the Dental Anxiety Scale. Anxiety, depression and GSI were more frequent in patients below the age of 46 than above. Women were more susceptible to signs of Anxiety and Somatization and scored higher on the Dental Anxiety Scale and the Global Severity Index than male patients. There was a significant positive correlation between scores of the BSI-18 categories: Somatization, Anxiety and Depression and the DAS for dental patients.

Conclusions: This study showed that a relationship between dental anxiety and psychological distress exists. It would be an improvement to use a short questionnaire like the Dental Anxiety Scale to evaluate a patient before his first treatment so that more appropriate treatments can be pursued.

Keywords: Dental anxiety, Stress, Psychological, Depression, Adult, Dental clinic, Cross-sectional studies, Surveys and Questionnaires, Male, Female

Background

Dental fear and anxiety are not commonly directed towards the dental practitioner but more towards the treatment and the possibility of pain. Research by Weiner and Sheehan [1] further differentiated the origins into exogenic and endogenic. The influence can be environmental and due to stigmatizing experiences (exogenic) or part of generalized anxiety (endogenic). Patients with dental fear are a challenge for the dentist and the dental staff and can cause more stress responses [2]. Studies have shown that 70% of the general population feels anxious before a dental examination, 20% of that group are

classified as highly anxious, and 5% evade dental treatments fully [3]. Dental anxiety, causing the patient to evade treatment, is a failure of modern dentistry to develop towards minimal invasiveness. Even though pain can be reduced to a minimum with modern day anaesthetics, it seems that the fear of pain overshadows the actual pain. Anxiety disorder is pervasive, as 25% of all general practitioners can diagnose symptoms among their patients [4]. When questioned, patients label dental anxiety as the second biggest trigger for psychological distress at 21%, just after public speaking at 27%. It is essential for a dentist to define which group of patients is likely to have dental anxiety. A study conducted on 73 subjects with dental phobia showed that 40% of this sample had a current Axis I diagnosis other than a simple phobia, with an anxiety disorder (20%) being the most common [5]. Mental disorders such as anxiety disorder or

* Correspondence: h.berth@ukdd.de

¹Technische Universität Dresden, Carl Gustav Carus Faculty of Medicine, Division of Psychological and Social Medicine and Developmental Neurosciences, Research Group Applied Medical Psychology and Medical Sociology, Fetscherstr. 74, 01307 Dresden, Germany
Full list of author information is available at the end of the article



depressive disorder could be highly associated with dental fear. Patients with post-traumatic stress disorder are affected most commonly.

Earlier studies exposed women to have a higher affinity for developing anxiety towards dental treatment [6]. Hakeberg compared the results of a male and female Swedish population with the Dental Anxiety Scale. Results showed a significantly higher dental anxiety in women between the age of 20 and 39 years compared to younger and older age groups [7]. A similar study by Stouthard found women between the ages of 26 to 35 to be most prone towards dental anxiety [8]. These results were confirmed in by Enkling.

Furthermore, it was determined that patients with a developed dental anxiety demand higher attention before, during and after the dental treatment [9]. Most patients wished for the most accurate information about the dental treatment they received, a sympathetic dentist and a pain-free dental examination. This evidence emphasised the significance of identifying dental fear in patients and being able to adapt towards their demands. Age seems to be a recurring factor, as fear of dental treatment is not common above the age of 60 [10–12]. Recent studies determine younger age groups to show higher levels of dental fear than older age groups [13]. However, it was also found that 15 to 25-year-olds showed fewer signs of dental fear than older individuals [14].

Due to these results, our aim in this study was to determine if there is a correlation between psychological distress measured with the frequently used BSI-18 and dental anxiety investigated by DAS. Furthermore, we tried to find a relationship between psychological distress and dental anxiety to age groups and gender.

Methods

In different studies, throughout 3 years (2012–2015), approximately 2000 patients were asked to participate. Out of these, 1549 (77.5%) patients were included in our research. The data was collected independently in the research group for Medical Psychology and Medical Sociology in Dresden (Germany). DAS and BSI-18 questionnaires were handed out to dental patients before their routine treatments. Patients were also given a set of descriptive questions, collecting information about age and gender differences. The questionnaires were then examined in 2016 by our research group. All patients needed to be 18 years old and give written informed consent. Only patients providing written informed consent were included as study participants. All questionnaires were analyzed using IBM SPSS V23 to reveal significant similarities or differences. The mean total values were calculated and then analyzed using an independent sample t-test. Chi-squared tests were used to determine significance between questionnaire categories and sample characteristics. Cohens d respectively Cramers v were calculated as estimates of effect

sizes. The coherence between dental anxiety and psychological distress were evaluated using Pearson correlations. P values equal or less than 0.05 were considered statistically significant. The research was conducted according to STROBE guidelines.

Brief symptom Inventory-18

The Brief Symptom Inventory-18 (BSI-18) was first introduced in 2000 by Derogatis [15] as a further shortened BSI, which contained 53 items out of the first Symptom-Checklist 90-R. Developed as an instrument to define the state of psychological stress with only 18 items [16], the BSI-18 was used on cancer patients, victims of terrorist attacks, posttraumatic stress, alcohol addiction, and other cohorts. The three scales depression, anxiety, and somatization each contained six items and were combined to the Global Severity Index (GSI). The scores were between 0 and 90. Each of the 18 items is defined by a timeframe of the last seven days on a scale with four choices between “Not at all” and “Extremely.” The reliability of the three scales was assessed in 2010 on a sample of 638 psychotherapeutic patients: Somatization $\alpha = 0.12$, Depression $\alpha = 0.84$, Anxiety $\alpha = 0.84$ and GSI $\alpha = 0.91$ [17]. The reliability of the different BSI-18 categories in our study was $\alpha = 0.80$. The BSI-18 determined the level of psychological distress in this study because patients were able to complete it quickly, its reliability and its quick overview of psychological symptoms.

Dental anxiety scale

The Dental Anxiety Scale - DAS was first introduced in 1969 by Corah and is used widely to assess dental fear in patients [18, 19]. It consists of four questions based on situations before and during dental treatment. The patients self-assessed themselves. Each issue was scored from 1 to (low anxiety) to 5 (high anxiety). The possible range of scores was 4 to 20 and therefore allowed the patient to be categorized into proven dental anxiety if the score was above a cut-off value of 15 [20], some anxiety at a value between 13 and 15 and little to none anxiety below a score of 13. The reliability of the Dental Anxiety Scale was $r_{tt} = 0.86$ [18]. In our study, the DAS had a reliability of $\alpha = 0.88$. This questionnaire was used to determine the level of dental anxiety in this study due to its shortness, as well as its scientifically proven reliability.

Results

In total, 1549 patients completed the questionnaires. Fifty-six percent of the patients were female (865/1549 patients), and 51 % of patients were at or above the age of 46 (779/1525). The mean age was 45.68 years (SD 18.70, range 18–88 years).

Age compared to dental anxiety and psychological distress

Ninety-nine percent (1527/1549) of all patients were divided into those younger than 46 years old (748/1527) and those at or above the age of 46 (779/1527) to be able to compare the averages of “younger” as well as “older” patients. The age 46 years was chosen due to it being the average age of our sample group. This data was then compared to the DAS category, and the patient was placed according to their score on the questionnaire (Table 1).

Most patients of both age groups were placed in the low anxiety category (1072/1528). In all categories, the spread of the two age groups was similar. There were more patients below the age of 46 in the high anxiety category than those at or above the age of 46. There were slightly more patients at or above the age of 46 in the low anxiety age group than those below the age of 46. There was no statistical significance found.

The same age groups were then divided into the BSI-18 categories Somatization, Depression and Anxiety, as well as the Global Severity Index (Table 1). Patients younger than 46 years old had approximately the same score as patients at or above 46 in the category Somatization. In the category Depression, younger patients had a higher average than older patients. This proved to be statistically significant. Anxiety was higher in younger patients than older patients. A significance was found. The overall Global Severity Index was higher for younger patients than older patients.

Gender compared to dental anxiety and psychological distress

The Dental Anxiety Scale was broken down into its categories and then searched for significant differences between female and male patients (Table 2). Most patients

are classified as having low dental anxiety (1084/1544). Patients with a high anxiety of dental treatment were in the minority. A statistically significant difference was found.

Table 2 shows the average scores achieved by female and male patients. Female patients had higher scores in the BSI-18 categories Somatization, Depression, Anxiety and the Global Severity Index. Results given by the DAS score can also be defined as statistically significant. Female patients achieved higher scores than male patients.

Comparing the relation between psychological distress (BSI-18) and dental anxiety (DAS)

A Pearson correlation was completed to compare the outcomes of the BSI-18 questionnaire and the DAS (Table 3). The results showed significant positive correlations between all BSI-18 categories and the DAS questionnaire.

Discussion

Comparing the categories of the Dental Anxiety Scale to patients at or above and below the age of 46 showed no statistical significance. These findings were strongly in contrast to those of similar studies [10, 12, 21–24] showing a decrease in the prevalence of dental anxiety in older populations compared to younger populations. An explanation could be the classification into only two age groups and a generalization of the words “young” and “old”. A flaw of the Dental Anxiety Scale is the non-inclusion of local anesthetics and a strong influence of a patients judgment of the treatment. Patients are most afraid of the pain and bodily harm done by the injection [25], even though 40% of younger age groups prefer a treatment with anesthesia [26]. The Modified Dental Anxiety Scale (MDAS), modeled on the

Table 1 Age of patients compared to dental anxiety categories (DAS) and psychological distress (BSI-18)

		Age		
		< 46 years (N, %)	≥ 46 years (N, %)	
Dental anxiety	Total sample (N, %)	< 46 years (N, %)	≥ 46 years (N, %)	Chi2-test
Low anxiety	1072 (70)	517 (69)	555 (71)	$\chi^2(2, N = 1527) = 0.95$, $p = 0.62$, $v = 0.457$
Moderate anxiety	379 (25)	191 (26)	188 (24)	
High anxiety	76 (5)	40 (5)	36 (5)	
Psychological distress	Total sample (M, SD)	< 46 years (M, SD)	≥ 46 years (M, SD)	t-test
Somatization	1.94 (2.90)	1.93 (2.76)	1.95 (3.03)	$t(1425) = -0.16$, $p = 0.874$, $d = -0.008$
Depression	1.88 (3.35)	2.33 (3.45)	1.43 (3.17)	$t(1423) = 5.16$, $p < 0.0001$, $d = 0.274$
Anxiety	2.78 (3.53)	3.20 (3.31)	2.39 (3.70)	$t(1425) = 4.31$, $p < 0.0001$, $d = 0.228$
GSI	6.59 (8.21)	7.44 (7.91)	5.76 (8.38)	$t(1426) = 3.89$, $p < 0.0001$, $d = 0.206$

Table 2 Gender of patients compared to dental anxiety categories (DAS) and psychological distress (BSI-18)

		Sex		
Dental anxiety	Total sample (N, %)	Male (N, %)	Female (N, %)	Chi2-test
Low anxiety	1084 (70)	510 (75)	574 (67)	$\chi^2(2, N = 1544) = 14.97$, $p = 0.001$, $v = 0.98$
Moderate anxiety	384 (25)	153 (22)	231 (27)	
High anxiety	76 (5)	21 (3)	55 (6)	
Psychological distress	Total sample (M, SD)	Male (M, SD)	Female (M, SD)	t-test
Somatization	1.94 (2.90)	1.73 (2.69)	2.10 (3.04)	$t(1418) = -2.47$, $p = 0.014$, $d = -0.131$
Depression	1.88 (3.35)	1.68 (3.47)	2.03 (3.24)	$t(1437) = -1.94$, $p = 0.052$, $d = -0.102$
Anxiety	2.78 (3.53)	2.29 (3.07)	3.19 (3.80)	$t(1438) = -4.96$, $p < 0.0001$, $d = -0.262$
GSI	6.59 (8.21)	5.69 (7.97)	7.31 (8.29)	$t(1384) = -3.76$, $p < 0.0001$, $d = -0.202$

original anxiety scale by Corah, includes an additional question about anesthetics [10]. Findings for the sample groups showed a connection between age groups and dental anxiety using the MDAS [21].

The Brief Symptom Inventory-18 was used to compare the same age groups. Findings indicated a higher presence of depression and anxiety in younger than in older patients. Increased experience, emotional control, and immunity to stressful experiences are possible factors supporting these results [27]. The older patient might be not working anymore and therefore can recover and prepare better for stressful experiences. There are, however, indications that symptoms of anxiety and depression begin to increase again [28]. Therefore, it is important not to assume an older patient to not be at risk for anxiety and depression symptoms. These results further emphasize the need for a comfortable and reliable dental anxiety screening method.

When comparing dental anxiety and the Global Severity Index with the gender of our sample, female patients were more susceptible to psychological distress regarding a dental treatment than male patients. This was a confirmation of earlier studies [4]. Women have a higher chance of developing dental anxiety than male patients

Table 3 Correlation between dental anxiety (DAS) and psychological distress (BSI-18)

	DAS		
	Pearson Correlation	Sig. (2-tailed)	N
Somatization	0.257	$p < 0.0001$	1439
Depression	0.158	$p < 0.0001$	1437
Anxiety	0.337	$p < 0.0001$	1439
GSI	0.301	$p < 0.0001$	1440

as we expected [29]. An explanation for this might be higher levels of neuroticism in women than men and it being correlated to anxiety [30–32].

Correlations between psychological distress and dental anxiety might be an indicator that patients with a generally higher level of psychological symptoms (depression, somatisation, anxiety) are at a higher risk for the development of specific anxieties such as dental fear. A similar study, comparing 212 patients with psychosomatic service with 95 healthy controls, confirmed these results [33]. The large sample size of this study was favorable in comparison to similar studies. Also, the use of a general population and not just patients with an existing diagnosis of anxiety allowed a non-biased view towards the results. However only patients voluntarily visiting a dentist were interviewed. Patients with a diagnosable dental anxiety and an aversion to dental visits could not be examined.

The BSI-18 and the DAS are scientifically reliable questionnaires and are frequently used for large sample sizes, as in this study. To improve the individual judgment of the patient's well-being, the more detailed BSI with 53 items or even the SCL-90R with 90 items could be applied in a subsequent study. There are also several factors for which the Dental Anxiety Scale is often criticised, such as the answering scheme not being consistent across the questionnaire and, most importantly, not including a question about local anaesthetics. The Modified Dental Anxiety Scale, validated by Humphris, Morrison and Lindsay in 1995 [34], improved these flaws and can be an interesting alternative to Corah's DAS.

All questionnaires were completed by the judgment of the patients themselves. It is therefore possible that some patients did not answer the questions truthfully

and might have reduced the severity of their answers to avoid being singled out as a patient with dental anxiety. The treatment the patients were expecting after their survey was not captured on any questionnaire. Patients with acute pain might already be psychologically weakened, expecting more pain and therefore fearing the treatment more than someone waiting for a routine dental check-up.

Patients suffering from dental anxiety are restricted in their daily routine. Most of the time, these patients will only choose to make a dental appointment if the pain becomes too unbearable. If the dentist is unaware of the patient's anxiety, the encounter can deteriorate. This should not be the experience first experience of an individual fearing dental treatment. Screening using the Dental Anxiety Scale is fast and easy and can prepare the dentist to handle the patient. This would, however, require that the dentist has been professionally prepared to treat a patient who fears his surroundings. Improvements can be made in preparing students during their training or given as a mandatory lecture. With the help of specialized practitioners and a fully prepared dentist, it may be possible to reduce dental anxiety in susceptible individuals.

Conclusions

Using a large sample of dental patients the results of the study showed strong associations between dental anxiety and psychological distress (somatization, depression, anxiety). Patients below the age of 46 and women report more psychological distress. Additionally, women described more dental anxiety compared to male patients.

Abbreviations

BSI-18: Brief Symptom Inventory-18; DAS: Dental Anxiety Scale; GSI: Global Severity Index, total Score of the Brief Symptom Inventory-18; IBM SPSS: Statistical Software for the Social Sciences; MDAS: Modified Dental Anxiety Scale; SCL-90R: Symptom-Checklist-90 Revised; STROBE: Strengthening the Reporting of Observational studies in Epidemiology

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Availability of data and materials

The datasets generated and/or analysed during the current study are available from the corresponding author on reasonable request.

Authors' contributions

HB constructed the study design. HB and CH had been involved in acquisition of data. AZ wrote the first draft of the manuscript. AZ, CH and HB contributed to statistical analysis, data interpretation, and manuscript drafting. All authors read and approved the final manuscript.

Ethics approval and consent to participate

The present study was approved by the Ethics Committee of the Technische Universität Dresden, Germany (EK232062011), and only individuals who provided written informed consent were included as study participants.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Author details

¹Technische Universität Dresden, Carl Gustav Carus Faculty of Medicine, Division of Psychological and Social Medicine and Developmental Neurosciences, Research Group Applied Medical Psychology and Medical Sociology, Fetscherstr. 74, 01307 Dresden, Germany. ²Universitätsklinikum Carl Gustav Carus Dresden, Policlinic of Dental Maintenance, Fetscherstr. 74, 01307 Dresden, Germany.

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References

- Weiner AA, Sheehan DV. Etiology of dental anxiety: psychological trauma or CNS chemical imbalance? *Gen Dent.* 1990;38:39–43.
- Heering-Sick H, Tönnies S. Stress of dentists caused by anxious patients. In: McGuigan FJ, Sime WE, Wallace JM, editors. *Stress and tension control 3: stress management.* Boston: Springer US; 1989. p. 119–26.
- Getka EJ, Glass CR. Behavioral and cognitive-behavioral approaches to the reduction of dental anxiety. *Behav Ther.* 1992;23:433–48.
- Wittchen HU, Essau CA, von Zerssen D, Krieg JC, Zaudig M. Lifetime and six-month prevalence of mental disorders in the Munich follow-up study. *Eur Arch Psychiatry Clin Neurosci.* 1992;241:247–58.
- Roy-Byrne PP, Milgrom P, Khoon-Mei T, Weinstein P, Katon W. Psychopathology and psychiatric diagnosis in subjects with dental phobia. *J Anxiety Disord.* 1994;8:19–31.
- Ragnarsson B, Arnlaugsson S, Karlsson KÖ, Magnússon ÞE, Arnarson EÖ. Dental anxiety in Iceland: an epidemiological postal survey. *Acta Odontol Scand.* 2009;61:283–8.
- Hakeberg M, Berggren U, Carlsson SG. Prevalence of dental anxiety in an adult population in a major urban area in Sweden. *Commun Dent Oral Epidemiol.* 1992;20:97–101.
- Stouthard MEA, Hoogstraten J. Prevalence of dental anxiety in the Netherlands. *Commun Dent Oral Epidemiol.* 1990;18:139–42.
- Enkling N, Marwinski G, Jöhren P. Dental anxiety in a representative sample of residents of a large German city. *Clin Oral Investig.* 2006;10:84–91.
- Humphris GM, Dyer TA, Robinson PG. The modified dental anxiety scale: UK general public population norms in 2008 with further psychometrics and effects of age. *BMC Oral Health.* 2009;9:20.
- Hagglin C, Hakeberg M, Ahlqwist M, Sullivan M, Berggren U. Factors associated with dental anxiety and attendance in middle-aged and elderly women. *Commun Dent Oral Epidemiol.* 2000;28:451–60.
- Locker D, Liddell AM. Correlates of dental anxiety among older adults. *J Dent Res.* 1991;70:198–203.
- Pekkan G, Kilicoglu A, Hatipoglu H. Relationship between dental anxiety, general anxiety level and depression in patients attending a university hospital dental clinic in Turkey. *Community Dent Health.* 2011;28:149–53.
- Lahti S, Vehkalahti MM, Nordblad A, Hausen H. Dental fear among population aged 30 years and older in Finland. *Acta Odontol Scand.* 2007;65:97–102.
- Derogatis NL. BSI 18, Brief Symptom Inventory 18: Administration, scoring and procedures manual; 2001. p. 47.
- Franke GH, Jäger S, Morfeld M, Salewski C, Reimer J, Rensing A, et al. Eignet sich das BSI-18 zur Erfassung der psychischen Belastung von nierentransplantierten Patienten. *Z Med Psychol.* 2010;19:30–7.

17. Franke GH, Ankerhold A, Haase M, Jäger S, Tögel C, Ulrich C, et al. Der Einsatz des brief symptom inventory 18 (BSI-18) bei Psychotherapiepatienten. *Psychother Psychosom Med Psychol*. 2011;61:82–6.
18. Corah NL. Development of a dental anxiety scale. *J Dent Res*. 1969;48:596.
19. Tönnies S, Mehrstedt M, Eisentraut I. Die Dental Anxiety Scale (DAS) und das Dental Fear Survey (DFS) – Zwei Messinstrumente zur Erfassung von Zahnbehandlungsängsten. *Z Med Psychol*. 2002;11:63–72.
20. Corah NL, Gale EN, Illig SJ. Assessment of a dental anxiety scale. *J Am Dent Assoc*. 1978;97:816–9.
21. Humphris GM, Freeman R, Campbell J, Tuutti H, D'Souza V. Further evidence for the reliability and validity of the modified dental anxiety scale. *Int Dent J*. 2000;50:367–70.
22. Hagglin C, Berggren U, Hakeberg M, Hällstrom T, Bengtsson C. Variations in dental anxiety among middle-aged and elderly women in Sweden: a longitudinal study between 1968 and 1996. *J Dent Res*. 1999;78:1655–61.
23. Caltabiano ML, Croker F, Page L, et al. Dental anxiety in patients attending a student dental clinic. *BMC Oral Health*. 2018;18:48.
24. Fayad MI, Elbieh A, Baig MN, Alruwaili SA. Prevalence of dental anxiety among dental patients in Saudi Arabia. *J Int Soc Prev Community Dent*. 2017;7:100–4.
25. Milgrom P, Coldwell SE, Getz T, Weinstein P, Ramsay DS. Four dimensions of fear of dental injections. *J Am Dent Assoc*. 1997;128:756–62.
26. Gordon SM, Dionne RA, Snyder J. Dental fear and anxiety as a barrier to accessing oral health care among patients with special health care needs. *Spec Care Dentist*. 1998;18:88–92.
27. Jorm AF. Does old age reduce the risk of anxiety and depression? A review of epidemiological studies across the adult life span. *Psychol Med*. 2000;30:11–22.
28. Teachman BA. Aging and negative affect: the rise and fall and rise of anxiety and depression symptoms. *Psychol Aging*. 2006;21:201–7.
29. Freeman R. A psychodynamic theory for dental phobia. *Br Dent J*. 1998;184:170–2.
30. Guentsch A, Stier C, Raschke GF, et al. Oral health and dental anxiety in a German practice-based sample. *Clin Oral Invest*. 2017;21:1675.
31. Freeman R. Communicating effectively: some practical suggestions. *Br Dent J*. 1999;187:240–4.
32. Stecher T. Well-being in an academic environment. *Med Edu*. 2004;38:465–78.
33. Lenk M, Berth H, Joraschky P, Petrowski K, Weidner K, Hannig C. Fear of dental treatment—an underrecognized symptom in people with impaired mental health. *Dtsch Arztebl Int*. 2013;110:517–22.
34. Humphris GM, Morrison T, Lindsay SJ. The modified dental anxiety scale: validation and United Kingdom norms. *Community Dent Health*. 1995;12:143–50.

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