Applicability of the Numeric Scale for Anxiety Evaluation in Patients Undergoing Dental Treatment

Przydatność skali numerycznej do oceny lęku u pacjentów przed zabiegami stomatologicznymi

Abstract

Background. Anxiety over dental procedures is a prevalent and serious problem both for patients and dentists. It undermines therapy effectiveness and is the main reason for avoiding dental appointments and treatment. Dental fear can be assessed using various scales; however, due to their complex and time-consuming nature, the scales are rarely used in regular clinical practice. Thus, there is a demand for a simple, immediate and reliable method that can be applied as a tool to assess anxiety and be accepted by dentists in everyday practice.

Objectives. The study was designed to determine the utility of the numeric scale for dental anxiety assessment.

Material and Methods. A total of 205 adult patients, both sexes, aged 18–81 years, were involved in the study. Before entering dental surgery, the patients were asked to complete Corah’s Dental Anxiety Scale (CDAS), State-Trait Anxiety Inventory (STAI), and to rate their fear on numeric scale (NRS). Furthermore, patients were asked to define the most unpleasant sensation accompanying dental treatment and determine the reason for appointment.

Results. Approximately 50% of the study population had high level of dental anxiety (assessed by CDAS), even more (60%) expressed high level of general anxiety (state-anxiety STAI). Pain during surgery and local anesthesia were identified as the main source of the most unpleasant sensations. We found a very high correlation between NRS and CDAS, and moderate between NRS and STAI.

Conclusions. NRS is a quick and reliable dental anxiety rating method (Dent. Med. Probl. 2015, 52, 2, 205–214).

Key words: adults, measures, numeric scale, dental anxiety, CDAS scale.

Słowa kluczowe: dorośli, lęk dentystyczny, metody oceny lęku, skala numeryczna, skala CDAS.
lays recovery and is also one of the main reasons for avoidance of dental care by patients [1, 2]. Most often dental anxiety stems from fear of unpleasant sensations, i.e. feeling of pain before dental procedures, such as anesthesia, drilling, tooth extraction or others. Strong feelings of anxiety and tension may appear long before dental appointment, getting even stronger in the waiting room, where characteristic noises of dental equipment can be heard [3].

Higher level of anxiety can result from the previously experienced negative memories associated with improper anesthetic technique or procedure performed in insufficient anesthesia [4]. Other researchers have shown that a fear of choking is also a very common cause of anxiety [5]. Moreover, a more profound analysis of the problem indicates that dental anxiety arises mostly in childhood and may be the result of traumatic experiences during dental appointment and treatment [6]. Sometimes it can also be associated with negative attitudes towards dental treatment expressed by patient’s family members [7]. In consequence, the anxiety felt by patients before dental treatment can take an extreme form of phobia, i.e. dental phobia, manifesting itself by excessive, irrational reactions to unpleasant stress associated with dental appointment [8]. Considering the significance of the problem, it is very important to identify patients with a high level of anxiety since it may have an influence on treatment plan, e.g. anesthesia technique, appointment schedule and so on. Thus, the diagnosis of anxiety prior to dental treatment is extremely valuable information. For this purpose, appropriate psychological scales can be used to quantitatively and qualitatively determine anxiety symptoms, e.g. the scale depicting the level of anxiety and attitude towards dental treatment – CDAS (Corah’s Dental Anxiety Scale), Kleinrench’s anxiety scale – DFS (Kleinrench’s Dental Fear Survey) or the one showing patient’s trust in the dentist – DBS (Getz Dental Beliefs Survey) [9, 10]. These scales are dedicated exclusively to patients in dental care. Other scales, including STAI (State-Trait Anxiety Inventory) is used as a diagnostic and research tool in virtually any medical speciality, primarily for patients anxiety assessment, sometimes even to evaluate the anxiety level among medical stuff [11].

Similarly to the feeling of anxiety, the feeling of pain is also subjective. A number of simple methods that can be used to assess pain intensity have been described. All are based on a patient’s evaluation using a suitable graded scale. The one that is easiest to apply is a numerical 0–10 scale (NRS), which allows a patient to choose one digit that best identifies pain severity, where 0 stands for no pain and 10 for unbearable pain. However, the most commonly used scale to assess pain is visual analogue scale (VAS), which is a 10 cm long segment with marked beginning (0) and end (10) [12]. The patient is asked to point with a finger or slider the intensity of pain from 0 – complete lack of pain to 10 – the strongest imaginable pain. It should be noted that the cyclically repeated measurements of pain intensity using VAS allow assessment of analgesia efficacy [13]. Previous studies have shown that nongraded visual tools display a wider distribution than graded ones [14], indicating that they might be more useful; nevertheless, there is a lack of consensus about which scale is more appropriate to use in specific medical conditions. The available literature offers only single reports, in which the methodological tools used to assess pain, such as NRS or VAS, were used to measure anxiety in hospitalized patients (prior to surgical procedures) [15].

Since the completion of CDAS, DBS or other questionnaires by patients followed by dentist’s interpretation is time consuming, this kind of technique is not routinely used in daily dental practice. There is a lack of a simple and easy tool that could be applied daily at the dental surgery to assess severity of anxiety. Consequently, the purpose of the current study is to determine the suitability of the numeric scale (NRS) for anxiety assessment in patients before dental procedures.

**Material and Methods**

The study group consisted of 205 patients aged 18–81 years, who reported at the Centre of Pediatric Dentistry and Orthodontics, at Czajek 5 Str.; 40-534 Katowice and Non-Public Health Care Facility, at Dworcowa 1 Str. 46-020 Czarnowęsy. Surveys were carried out directly before the dental visit. Patients were asked to complete: (1) the Corah’s scale CDAS to assess the level of anxiety and attitude to dental treatment, (2) State-Trait Anxiety Inventory STAI, (3) NRS measuring anxiety immediately before entering dental office, (4) a form determining the source of the most unpleasant experiences in dental treatment, by choosing from five given responses and (5) a form determining the cause of dental appointment.

CDAS consists of four questions that relate to four dental treatment-associated situations, to which responses are chosen from a 5-point scale assessing the intensity of anxiety in a given situation. The score may range from 4 to 20 points. The final assessment of the level of anxiety is given by the sum of points of scale items: 4 is considered as not anxious, 5–8 is slightly anxious, 9–12
is fairly anxious, 13–16 is very anxious, and 17–20 is extremely anxious bordering on phobia [16, 17].

The STAI designed by Spielberger and adapted by Sosnowski et al. [18] is a method of self-esteem, with the level of anxiety expressed as the number of points. It consists of two separate scales, one of which is represented by the X-1 symbol and is used to measure state anxiety, i.e. situational anxiety. The other scale is marked with the X-2 symbol, and is applied to measure anxiety as a relatively constant personality trait. The raw results obtained are interpreted by referring to the relevant sten scores and then categorized into three levels of anxiety: low (1–4 sten), moderate (5–6 sten) and high (7–10 sten).

Respondents were also asked to indicate the severity of anxiety according to NRS immediately before entering a dental office. Obtained raw results were used in further analysis with one exception, i.e. for CDAS vs. NRS scales comparison, the raw results of NRS were additionally categorized as follow: 0 – not anxious, 1 to 3 – slightly anxious, 4 to 6 – fairly anxious, 7 to 9 – very anxious and 10 – extremely anxious. Patients were also asked to determine the source of the most unpleasant sensations at the dentist’s office, choosing from among five answers: (1) pain during dental procedure, (2) pain caused by local anesthesia, (3) prolonged waiting for treatment, (4) inappropriate attitude of a dentist, and (5) another reason not included above. At the end, patients were asked about the reason for their visit at the dentist’s office, i.e.: (1) surgical procedure (implant grafting, sinus lifting, bone reconstruction, resection, etc.), (2) tooth extraction, (3) dental treatment, (4) hygienic procedure, (5) check-up and (6) do not know.

The statistical analysis was performed with Statistica 8.0 PL and MS Excel 2007 software. Parametric data was analyzed using Student’s t test, nonparametric data with Mann-Whitney U test. Spearman test was used to assess correlation. p < 0.05 was set as statistically significant.

Results

Description

Among the study respondents, patients aged 31–40 constituted the largest group (29%), those aged less than 31 years 22%, the 41–50 years old patients accounted for 20%, the 51–60 year old patients for 16% and over 61 for 13%. There were 54% of women and 46% of men.

Assessment of the level of anxiety by CDAS showed that 26% of the study respondents were “being afraid”, 23% were “anxious – avoidant”, 32% “very anxious” and 17% “extremely anxious”. Only 2% of the respondents declared complete lack of fear.

Anxiety as a state measured by STAI showed its low level in 8% of the respondents, moderate level in 28% and high in 64%. The level of anxiety as a trait determined by STAI was found to be low in 28% of the respondents, moderate in 45% and high in 27%.

As a source of the most unpleasant experiences, 50% of the respondents identified pain on treatment, 18% pain during local anesthesia, 10% reported inappropriate attitude of the dentist, 17% prolonged waiting time for treatment and 5% mentioned other causes.

The analysis of the reasons for dental appointment revealed that 45% visited a dental office for dental treatment, 23% for tooth extraction, 9% for surgery, 7% for hygienic procedure, 9% for a check-up and 7% could not clearly identify the type of procedure.

Analysis

No correlation was observed between the age of respondents and the intensity of the anxiety measured by NRS (R Spearman’s r = 0.1247, p = 0.792), CDAS (R Spearman’s r = 0.1299, p = 0.063) and anxiety-state STAI (R Spearman r = 0.1049, p = 0.098), anxiety-trait STAI (R Spearman’s r = 0.0217, p = 0.757).

Women were found to have higher levels of dental anxiety measured with CDAS (U Mann-Whitney test, U = 4032, p < 0.05), but not with NRS (t-test, t = –1.1453, p = 0.253), anxiety-state STAI (R Spearman r = 0.1049, p = 0.098), anxiety-trait STAI (R Spearman’s r = 0.0217, p = 0.757) (Table 1).

We found a very high correlation between NRS raw score and CDAS (R Spearman’s r = 0.7616, p < 0.05) (Fig. 1). Very similar correlation was found between NRS categorized in 5 anxiety levels and CDAS (R Spearman’s r = 0.7357, p < 0.05) (data not presented in graphical form). Moderate correlation was noted between the NRS raw score and anxiety-state STAI (R Spearman’s r = 0.6563, p < 0.05) and anxiety-trait STAI (R Spearman’s r = 0.3456, p < 0.05) (Fig. 2 and 3). Moderate correlation was also found between the CDAS score and anxiety-state STAI (R Spearman’s r = 0.6022, p < 0.05), whereas low correlation between CDAS and anxiety-trait STAI (R Spearman’s r = 0.3217, p < 0.05) (Fig. 4 and 5).

Moderate correlation was revealed between the type of dental procedure and the NRS score (R Spearman’s r = 0.4212, p < 0.05), and CDAS (R Spearman’s r = 0.3585, p < 0.05) (Fig. 6 and 7).
Low correlation was demonstrated between the anxiety-state STAI score, the anxiety-trait STAI score and the type of dental procedure (R Spearman’s $r = 0.2668$, $p < 0.05$ and R Spearman’s $r = 0.2424$, $p < 0.05$ respectively (Fig. 8 and 9).

**Table 1. Relationship between NRS, CDAS, STAI and age or gender**

<table>
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<tr>
<th>Variable</th>
<th>n</th>
<th>$p$ value</th>
<th>Coefficient</th>
<th>Statistical test</th>
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<td>0.216</td>
<td>$r = 0.1247$</td>
<td>R Spearman</td>
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**Discussion**

Dental anxiety is one of the four most common fears experienced by modern man alongside fear of snakes, heights and body injury. It takes the first place (3.7%) among the phobias, being followed by the phobia of heights (3.1%) and ago-
raphobia (2.7%) [19]. In our study population, using CDAS we found a very high level of fear (phobia) in 17% of respondents and a high level of fear in 32% of patients. Data concerning the high level of dental anxiety in Europe and other regions is divergent, ranging from 4 to 30%, including 4%
in Denmark [20], 11% in Germany [21], 9% in the USA [22], and 4.38 – 30% in Asia [23, 24]. The relatively large discrepancies can be explained by cultural differences, socioeconomic conditions and different models of health care, including dental care. Diverse methodologies applied are also significant. Nevertheless, the results obtained in the current study (17% of patients with phobia) clearly indicate the need to acknowledge the problem of dental anxiety among patients in Poland and to take appropriate preventive measures.

It should be also noted that dental anxiety is related to general anxiety, childhood experiences, and a dentist’s behavior and traits [25]. In the study population, STAI (used for the assessment of general anxiety) revealed high levels of trait anxiety, i.e. constant inner disposition in 27% of study participants and high levels of state anxiety in 64% of respondents. The result obtained for state anxiety (64%) with STAI is substantially higher than that obtained with CDAS (17% of extremely anxious patients) – designed specifically to estimate dental anxiety. The differences seem to be due to the fact that STAI categorizes participants only into three groups, i.e. with low, moderate and high levels of anxiety, while CDAS, being more specific, distinguishes five states, of which at least the first two (people with a very high level of anxiety and somatic symptoms, and those with high intensity of anxiety without somatic complaints) may correspond to the high anxiety category according to STAI. Berggren [26], studying a group of 109 adult patients, confirmed that general anxiety is a very important factor in the etiology of dental anxiety. Other researchers have found that people with a high degree of dental anxiety complain of one or more of common fears 3.2 times (mail survey) or 2.2 times (telephone survey) more frequently than those with a low degree of anxiety [27]. Fuentes et al. [28], studying the population of 1,030 women and men, showed a high correlation between the CDAS score and the anxiety-state STAI outcome.
However, it was a one-way correlation, i.e. those with a high degree of dental anxiety presented with a high level of general anxiety, but not the reverse. In our study, moderate correlation was confirmed between CDAS and the anxiety-state STAI. Concluding, dental appointment is not only associated with the risk of a higher level of dental anxiety, but also general anxiety, which is consistent with literature data [29].

Many literature reports analyze differences in the prevalence of dental anxiety depending on such variables as age, gender, education, socioeconomic status and others. Olszewska et al. [30] demonstrated that the severity of dental anxiety in patients may depend on such factors as gender, age and type of treatment performed. Their findings as well as reports of other authors are consistent with our study, as women were shown to have higher levels of dental anxiety measured with CDAS. Conversely, no correlation was found between age of the respondents surveyed and severity of anxiety measured with NRS and STAI. The results contradict the data reported by Dogan et al. [31], who in the population of children aged 8–12 years found a relationship between the severity of anxiety and age and socioeconomic status. However, our study was conducted on the population of adults.

In our study, pain during dental procedure was the source of the most unpleasant sensations for as many as 50% of respondents, pain during local anesthesia for 18%, inappropriate attitude of a dentist for 10%, prolonged waiting for treatment for 13% and other causes for 5%. Borowy et al. [32], who analyzed the levels of dental anxiety and attitude towards dentists among students of Cracow universities, showed that pain during dental treatment was the most unpleasant experience for 48.9%, whereas prolonged waiting time for an appointment for 21.7% of respondents. Other responses indicated pain during local anesthesia (9.8%), inappropriate attitude of a dentist (9.8%)
and other reasons (9.8%). The analysis of the above data and our own observations show that fear of pain during dental treatment is the most common source of unpleasant sensations at the dentist’s. Not only pharmacological analgesia plays an essential role in eliminating the pain factor, but also proper communication aimed to explain the course of treatment may help a patient mentally prepare for treatment, giving a sense of co-participation [33]. Considering the significance of the problem, it is important to identify patients with high levels of anxiety, as this may affect the therapeutic process, i.e. anesthetic technique, treatment plan, appointment scheduling and others. The diagnosis of dental fear is extremely valuable information for a dentist. In the current study, the level of dental anxiety was assessed with NRS taken from the methodology of pain research, STAI measuring general anxiety and CDAS specifically targeting dental patients.

High correlation was noted between NRS and CDAS (r = 0.761, p < 0.05) and moderate correlation with the anxiety-state STAI (r = 0.656, p < 0.05). There are no literature reports concerning this problem from the dental perspective. Only single reports are available, in which VAS (taken from pain assessment methodology), a tool similar to NRS, was used to measure anxiety in patients before surgeries. Millar et al. [34] who studied the usefulness of VAS in the assessment of anxiety on a sample group of 44 patients before surgery compared the obtained results with the STAI score and Hospital Anxiety and Depression Scale (HADS). They concluded that VAS is extremely useful in the assessment of anxiety. Their research was continued by Kindler et al. [35] and in Poland by Romanik et al. [15], who explored the subject and obtained very similar results. As demonstrated by these researchers, this method can be widely used to assess the level of anxiety in hospitalized patients. Also our recently published work on VAS application for anxiety assessment in cancer patients undergoing adjunctive or palliative chemotherapy showed its high utility as a simple and reliable “instrument” for the evaluation of this parameter [36].

Concluding, the existing scales used to assess dental anxiety do not appear “friendly” in the clinical settings. Our method seems to fill the gap, offering immediate and reliable assessment of the degree of anxiety in adult patients who come to the dental office.

References

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