

Patient–dentist relationship and dental anxiety among young Sudanese adult patients

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Objective: To evaluate the effects of the patient–dentist relationship on dental anxiety among young adult Sudanese patients. **Materials and methods:** In this cross-sectional study, 864 patients attending outpatient dental clinics of the governmental dental hospitals in Khartoum, Sudan were recruited; 51.2% were males and 48.8% were females, with an age range of 18–24 years. The questionnaire used evaluated the socio-demographics, education levels, economic status, patient experience, and also included the Dental Anxiety Scale, Corah (*J Dent Res* 1969 48: 596). **Results:** High dental anxiety was reported by 22.2%, 29.5% reported moderate dental anxiety, and 48.3% reported low or no dental anxiety. There were statistically significant associations between dental anxiety and gender, time lapse since the previous dental visit ($P < 0.004$) and the reason for the previous visit ($P < 0.001$). In addition, the dental clinic environment ($P < 0.002$), the time waiting before seeing the dentist ($P < 0.001$) and the overhearing of pain expressed by other patients ($P < 0.001$) were also statistically significant. Negative comments by the treating dentist also had a statistically significant impact ($P < 0.032$). In contrast, a clear explanation of related dental care ($P < 0.008$), as well as the allowance of adequate time to discuss oral health ($P < 0.006$), had significantly positive effects. **Conclusion:** The study showed that the patient–dentist relationship had a significant association with dental anxiety, and may be an important target for improving the delivery and standards of oral health in dentally anxious patients in this region.

Key words: Patient–dentist relationship, dental anxiety, dental fear, dental visit, Corah scale

INTRODUCTION

Anxiety is a limiting factor in patients seeking dental services. It is psychological, and patients can hide it. Hence, it is difficult to assess and manage. It is a complex phenomenon with external and internal influences. The external influences are directly or indirectly related to adverse experiences, while the internal influences are probably genetically determined and physiological in nature¹. These influences, added to an irregular visiting pattern and disease experience, have a negative impact and likely result in poor oral health^{2–6}. Dental anxiety, therefore, is a significant factor in being dentally disadvantaged, as anxious individuals usually avoid dental care, limiting the provision of and access to dental care^{7,8}. Anxious

patients can also become trapped in a ‘vicious cycle’ that is hard to break, and their ability to develop a coping mechanism in a dental care setting is challenged due to the added negative expectations regarding their treatment⁷. As a result, their oral status deteriorates, complicating their treatment even further. They also take longer to treat with occupational stress among the dental team becoming more likely, influencing the patient–dentist relationship^{9,10}.

Patients cite negative statements made by the dentist or the dental team, particularly condescending remarks, as anxiety triggers¹¹. These undesirable dentist behaviours have an odds ratio of 9.3 in reporting anxiety¹¹. Past negative experiences seem to be the main reason for dental anxiety¹². Situations that a patient had encountered (or had observed or been told

about) that were frightening from the patient's viewpoint can later result in a reaction and behavioural pattern when an experienced stimuli is triggered or recollected¹³.

Young adults are often more anxious than younger children, teenagers and middle-aged people. The incidence of dental anxiety seems to develop between 18 and 26 years, and this may be attributed to the psychological influences associated with becoming an adult¹⁴.

The significant impact of dental anxiety on oral health justifies the need to evaluate this phenomenon, particularly since the patient–dentist relationship has not been previously investigated in this population. In Sudan, the dentist-to-patient ratio is 1:33,000, compared with approximately 1:2,000 in most industrialised countries^{15,16}. The mean DMFT (decay, missing and filled teeth) in Khartoum for the age group 16–24 years was 4.2 (3.4); the decayed (D) was 2.9 (SD 2.6) and for missing teeth was 1.2 (SD 1.9)¹⁶.

The hypothesis is that the patient–dentist relationship influences have an impact on dental anxiety in the study group. The aim was to assess dental anxiety and the influence of the interactions with the dentist on anxiety.

MATERIALS AND METHODS

This study is a cross-sectional study, and the target populations were patients aged 18–24 years of age, attending the outpatient dental clinics of the governmental dental hospitals in Khartoum, Sudan. The public hospital sites involved in this study were the Khartoum Teaching Hospital, the Police Forces Teaching Hospital, and the Military Forces Hospital. While oral health services are also provided through different partners, including university clinics, private sector and civil society, the main bulk of oral health services in the Khartoum is provided through these hospitals to a population of 5,274,320¹⁷. From the Fifth Population and Housing Census¹⁷ of the whole of Sudan, the estimated age distribution for the group 18–24 years in Khartoum is approximately 3,259,107 (1,765,404 males and 1,493,703 females).

Convenience sampling was used to select the hospitals, to provide an overall picture of this diverse population, made up of different tribes, levels of education and socioeconomic statuses, which would be representative of a cross-section of the Khartoum population.

A study protocol was submitted to the ethics committee of the Sudanese Medical Specialization Board (S.M.S.B.) for approval; ensuring adherence to ethical principles such as those specified by the World Medical Association Declaration of Helsinki, and the ethical approval was granted. The questionnaire was translated into Arabic language by a bilingual

translator (with forward and backward translation for linguistic validity). Following an explanation of the study, each participant signed an informed consent. The participants were assured anonymity and confidentiality, and that declining to participate would not affect their current and future treatment.

The sample was determined as 864 patients; 288 per hospital, with a margin of error of 5%, assuming an average anticipated prevalence of dental anxiety as 25%^{3,18}. The formula used for sample size calculations is $n = |4p(1-p)/m^2|$, where p is the anticipated prevalence and m is the margin of error. The sample was made up of a non-probability convenience sampling. The questionnaire's first and second parts (demographics and the dental experience) were collected till a saturation of 288 per hospital was reached (864 participants). Those with previous dental experience accounted for 90.6% (783), while 9.4% (81) had no dental experience and hence were excluded from completing the study.

The variables in the study were the socio-demographic variables, including sex, age and level of education, dental insurance and economic status. The outcome variable was dental anxiety, and the exposure variables were the dentist–patient interactions, clinical environment, dental experience, regular dental visits and the reason for the dental visit. The exclusion criteria were those with known psychological problems or taking anti-depressants.

The third part of the questionnaire was related to the influences on dental anxiety, which were the dental clinic environment, the drill, voice of patients in pain, time spent in the waiting area and the effects of soft music. The fourth part utilised the Dental Anxiety Scale, Corah¹⁹. It is a validated and extensively used scale that 'contains four multiple-choice items regarding the patient's subjective reactions to going to the dentist, waiting in the dentist's office for a procedure, and the anticipation of drilling and scaling'. Each item is scored on a 1–5-point scale. Each question thus carried a maximum possible score of 5, with a total possible minimum score of 5 and a maximum score of 20¹⁹. The anxiety rating was calculated as the sum of the scores of the four multiple-choice items. According to Corah¹⁹, each question is scored from 1 (not anxious) to 5 (extremely anxious), with a range of 4–20. The cut-off point of more than 15 indicates high anxiety level or possibly phobic. Hence, scores less than 12 were considered to indicate low anxiety; 12–14 indicated moderate anxiety; and scores greater than 14 indicated high anxiety¹⁹. In this study, those that scored less than 12 were grouped into low anxiety or no anxiety as they can be managed without difficulty. Those with scores of 12–14 are of moderate anxiety, but have a particular stressor that should be discussed and managed. Those with scores 15 and

above are managed through dental concerns assessment and may require the help of a mental health therapist¹⁹.

The questionnaires were completed by three interviewers, who were trained to strictly adhere to the questions and answers format, with the same degree and level of questioning.

Data analysis

The data were collected and entered into the EpiData software, version 3.1²⁰. The data were analysed using statistical package STATA 11 software (StataCorp, College Station, TX, USA). The data were summarised using percentages, means and standard deviation. Significance testing of the difference between proportions was conducted using the chi-square test, Bonferroni's test, Dunnett's test, the Kruskal–Wallis test and one-way analysis of variance (ANOVA), depending on the number of observations, with a value of $P < 0.05$ corresponding to statistical significance, unless otherwise stated.

RESULTS

Of the 783 patients with previous dental experience, 51.5% were males and 48.5% females, and a mean age of 21.4 years with a standard deviation of 2.0. Those who declined participation in the Khartoum Teaching Hospital were 4.1%, and the majority were females with a mean age of 19.5 years. At the Police Forces Hospital, 14.5% declined, and the majority was males, with a mean age of 21.2 years. For the Military Hospital, 12.8% declined participation, with a mean age of 20.8 years, and the majority were also males.

Outcome variables of anxiety

The prevalence of various degrees of dental anxiety was as follows; 22.2% had high dental anxiety, 29.5% had moderate dental anxiety, and 48.3% had low or no dental anxiety (Table 1).

Socio-demographic variables and anxiety

The relationships between dental anxiety and the socio-demographic variables are presented in Table 1. The statistically significant association was between anxiety and gender ($P < 0.008$). The relationship between the level of education and dental anxiety was not statistically significant ($P > 0.543$), neither was the standard of income and dental anxiety ($P > 0.078$). There was also no statistically significant association between the dental insurance status and dental anxiety ($P > 0.434$; Table 1). The time interval since the

Table 1 Socio-demographic variables and dental anxiety (DAS) (chi-square test)

	Dental anxiety level			Chi-square <i>P</i> -value*
	Low or no anxiety Count (%)	Moderate anxiety Count (%)	High anxiety Count (%)	
Gender				
Male 403 (51.5%)	212 (27.1)	118 (15.1)	73 (9.3)	0.008
Female 380 (48.5%)	166 (21.2)	113 (14.4)	101 (12.9)	
Total	378 (48.3)	231 (29.5)	174 (22.2)	
Level of education				
None 50 (6.4%)	19 (2.4)	21 (2.7)	10 (1.3)	0.543
Khalwa (preschool) 41 (5.2%)	21 (2.7)	11 (1.4)	9 (1.1)	
Primary school 73 (9.3%)	36 (4.6)	16 (2)	21 (2.7)	
Secondary school 120 (15.3%)	58 (7.4)	40 (5.1)	22 (2.8)	
University 440 (56.2%)	217 (27.7)	124 (15.8)	99 (12.6)	
Postgraduate 59 (7.2%)	27 (3.4)	19 (2.4)	13 (1.7)	
Total	378 (48.3)	231 (29.5)	174 (22.2)	
Dental insurance				
Yes (48.1%)	188 (24)	103 (13.2)	86 (11)	0.434
No (51.9%)	190 (24.3)	128 (16.3)	88 (11.2)	
Total	378 (48.3)	231 (29.5)	174 (22.2)	
Economic status				
Below standard 210 (26.8%)	98 (12.5)	67 (8.6)	45 (5.7)	0.078
Within standard 102 (13%)	52 (6.6)	39 (5)	11 (1.4)	
Above standard 63 (8%)	35 (4.5)	14 (1.8)	14 (1.8)	
High standard 66 (8.4%)	31 (4)	17 (2.2)	18 (2.3)	
None 342 (43.7%)	162 (20.7)	94 (12)	86 (11)	
Total	378 (48.3)	231 (29.5)	174 (22.2)	

* $P < 0.05$ indicates statistical significance (in bold).

previous visit to the dentist and dental anxiety was statistically significant ($P < 0.004$; Table 2).

The box plot graph shows that the normality assumption holds (normally distributed data). Analysis of variance (ANOVA) was used to verify the effect of the previous visit on anxiety ($P < 0.0002$). The Bonferroni test was used for pairwise comparison of the time since the previous visit ($P < 0.003$), suggesting a statistically significant difference between anxiety and intervals of 6–10 years and 6 months or less since the previous visit. There were also statistically significant differences between the 6–10-year and 7–11-month intervals ($P < 0.001$), and also between 1–5-year and 7–11-month intervals ($P < 0.031$; Table 3).

A previous negative dental experience had been experienced by 25.7%, while 74.3% had never had a negative dental experience. In general, there was no statistically significant relationship between a previous

Table 2 Dental anxiety (DAS) and exposure variables (chi-square test)

	Dental anxiety level			P-value*
	Low or no anxiety Count (%)	Moderate anxiety Count (%)	High anxiety Count (%)	
Interval since the previous dental visit				
6 months or less 269 (34.4%)	140 (17.9)	78 (10.0)	51 (6.5)	< 0.004
7–11 months 193 (24.6%)	110 (14)	46 (5.9)	37 (4.7)	
1–5 years 202 (25.8%)	86 (11)	65 (8.3)	51 (6.5)	
6–10 years 119 (15.2%)	42 (5.4)	42 (5.4)	35 (4.5)	
Total	378 (48.28)	231 (29.50)	174 (22.22)	
Reason for the previous dental visit				
Check-up 132 (16.9%)	91 (11.6)	25 (3.2)	16 (2)	< 0.0001
Occasionally 117 (14.9%)	68 (8.7)	27 (3.4)	22 (2.8)	
Problem 534 (68.2%)	219 (28)	179 (22.9)	136 (17.4)	
Total	378 (48.28)	231 (29.50)	174 (22.22)	
Dental clinic environment				
Yes 425 (54.3%)	230 (29.4)	110 (14)	85 (10.9)	< 0.002
No 358 (45.7%)	148 (18.9)	121 (15.5)	89 (11.4)	
Total	378 (48.28)	231 (29.50)	174 (22.22)	
Sound of pain expressed by patients				
Yes 372 (47.5%)	136 (17.4)	123 (15.7)	113 (14.4)	< 0.0001
No 411 (52.5%)	242 (30.9)	108 (13.8)	61 (7.8)	
Total	378 (48.28)	231 (29.50)	174 (22.22)	

*P < 0.05, indicates statistical significance (in bold).

Table 3 Pairwise comparison of the time since the previous visit

	6 months or less	7–11 months	1–5 years
7–11 months	1		
1–5 years	0.074	0.031	
6–10 years	0.003	0.001	1

P < 0.05 indicates significant difference between the groups.

Table 4 Relationship of dental anxiety (DAS) to patient experience, preference for a certain dentist, and the use of soft music in the dental practice

	Dental anxiety level			Chi-square P-value*
	Low or no anxiety Count (%)	Moderate anxiety Count (%)	High anxiety Count (%)	
Negative dental experience				
Yes 201 (25.7%)	83 (10.6)	69 (8.8)	49 (6.3)	> 0.066
No 582 (74.3%)	295 (37.7)	162 (20.7)	125 (16.0)	
Total	378 (48.3)	231 (29.5)	174 (22.2)	
Patient preference to go for certain dentist				
Yes 350 (44.7%)	187 (23.9)	83 (10.6)	80 (10.2)	< 0.005
No 433 (55.3%)	191 (24.4)	148 (18.9)	94 (12)	
Total	378 (48.3)	231 (29.5)	174 (22.2)	
Soft music				
Yes 502 (64.1%)	253 (32.3)	144 (18.4)	105 (13.4)	> 0.260
No 281 (35.9%)	125 (16)	87 (11.1)	69 (8.8)	
Total	378 (48.3)	231 (29.5)	174 (22.2)	

*P < 0.05 indicates statistical significance (in bold).

negative dental experience and dental anxiety ($P > 0.066$; Table 4).

For the reason of the previous dental visit, the normality assumption did not hold (data not normally

Table 5 Pairwise comparison of the P-values associated with the reasons for the dental visits

Reason for attendance	Check-up	Occasional
Occasional attendance	0.05	
Attendance with a problem	< 0.0005	< 0.0005

distributed). Therefore, the Kruskal–Wallis test was used to assess the effects of the reasons for the previous visit on dental anxiety. The P-value ($P < 0.0001$) suggested a significant difference between the groups. Therefore, Dunnett’s test was used for pairwise comparison of the P-values associated with the reasons for the dental visits. It was found that dental anxiety among patients attending with a dental problem was significantly greater than those visiting for routine, regular or occasional check-ups ($P < 0.0005$; Table 5).

Three-hundred and fifty of the participants reported a preference for an individual dentist. Having the treatment performed by the patient’s preferred dentist had a significant effect on reduced anxiety ($P < 0.005$; Table 4). The use of soft music in the dental practice was also thought to have a positive effect on dental anxiety by 64.1% of patients. However, this was not significantly associated with anxiety ($P > 0.260$; Table 5). The sound of the air-rotor (drill) was reported by 55.9% to be a trigger for dental anxiety, and 44.1% did not consider it to be a trigger. The sound of the air-rotor (drill) as a trigger was statistically significant ($P < 0.0005$). The smell related to cavity preparation was a trigger for dental anxiety for 51.9%, and 48.1% reported that it had no influence

Table 6 Association of the sound and smell of the drill, as well as the time spent in the waiting area, with dental anxiety (DAS)

	Low or no anxiety Frequency (%)	Moderate anxiety Frequency (%)	High anxiety Frequency (%)	Chi-square P-value
Sound of the drill				
Yes 438 (55.9%)	165 (21.1)	143 (18.3)	130 (16.6)	< 0.0005
No 345 (44.1%)	213 (27.2)	88 (11.2)	44 (5.6)	
Total	378 (48.3)	231 (29.5)	174 (22.2)	
Smell of the drill				
Yes 406 (51.9%)	161 (20.6)	132 (16.9)	113 (14.4)	< 0.0005
No 377 (48.1%)	217 (27.7)	99 (12.6)	61 (7.8)	
Total	378 (48.3)	231 (29.5)	174 (22.2)	
Time spent in the waiting area				
Less than 15 minutes 290 (37%)	123 (15.7)	100 (12.8)	67 (8.6)	< 0.001
15–30 minutes 234 (29.9%)	114 (14.6)	78 (33.3)	42 (5.4)	
More than 30 minutes 259 (33.1%)	141 (18.0)	53 (6.8)	65 (25.18.3)	
Total	378 (48.3)	231 (29.5)	174 (22.2)	

$P < 0.05$.

Table 7 Association of patient–dentist interaction and dental anxiety (DAS)

	Dental anxiety level			Chi-square P-value
	Low or no anxiety	Moderate anxiety	High anxiety	
Dentist explains reasons for dental care in a way that could be understood				
Yes 550 (70.2%)	284 (36.3)	157 (20.1)	109 (13.9)	< 0.008
No 233 (29.8%)	94 (12)	74 (9.5)	65 (8.3)	
Total	378 (48.3)	231 (29.5)	174 (22.2)	
Treated with respect and dignity				
Yes 701 (89.5%)	337 (43)	213 (27.0)	151 (19.3)	> 0.199
No 82 (10.5%)	41 (5.2)	18 (2.3)	23 (2.9)	
Total	378 (48.3)	231 (29.5)	174 (22.2)	
Confidence in their dentist				
Yes 681 (87%)	335 (42.8)	197 (25.2)	149 (19)	> 0.413
No 102 (13%)	43 (5.5)	34 (4.3)	25 (3.2)	
Total	378 (48.3)	231 (29.5)	174 (22.2)	
Negative response				
Yes 193 (24.6%)	86 (11)	51 (6.5)	56 (7.2)	< 0.032
No 590 (75.4%)	292 (37.3)	180 (23)	118 (15.1)	
Total	378 (48.3)	231 (29.5)	174 (22.2)	
Listen to me when I explain my problem				
Yes 674 (86.1%)	327 (41.8)	205 (26.2)	142 (18.1)	> 0.115
No 109 (13.9%)	51 (6.5)	26 (3.3)	32 (4.1)	
Total	378 (48.3)	231 (29.5)	174 (22.2)	
Given enough time to discuss own oral health with the dentist				
Yes 633 (80.8%)	315 (40.2)	192 (24.5)	126 (16.1)	< 0.006
No 150 (19.2%)	63 (8)	39 (5)	48 (6.1)	
Total	378 (48.3)	231 (29.5)	174 (22.2)	
Was involved in decisions about dental treatment				
Yes 578 (73.8%)	386 (36.5)	170 (21.7)	122 (15.6)	> 0.386
No 205 (26.2%)	92 (11.7)	61 (7.8)	52 (6.6)	
Total	378 (48.3)	231 (29.5)	174 (22.2)	
Getting answers that can be understood				
Yes 667 (86.5%)	334 (42.7)	198 (25.3)	145 (18.5)	> 0.256
No 106 (13.5%)	44 (5.6)	33 (4.2)	29 (3.7)	
Total	378 (48.3)	231 (29.5)	174 (22.2)	

on anxiety. The smell related to cavity preparation was also a statistically significant trigger for dental anxiety ($P < 0.0005$; *Table 6*).

A time of less than 15 minutes spent in the waiting area was found by 37% to have an influence, and 29.9% reported that 15–30 minutes waiting had an effect on anxiety. Furthermore, 33.1% reported that more than 30 minutes had an influence on dental

anxiety. Time spent in the waiting area was significantly associated with dental anxiety ($P < 0.001$; *Table 6*).

The box plot showed that the normality assumption did not hold (data not normally distributed); therefore, the Kruskal–Wallis test was used to verify the association between time spent in the waiting area and the anxiety score. The P -value ($P < 0.0045$)

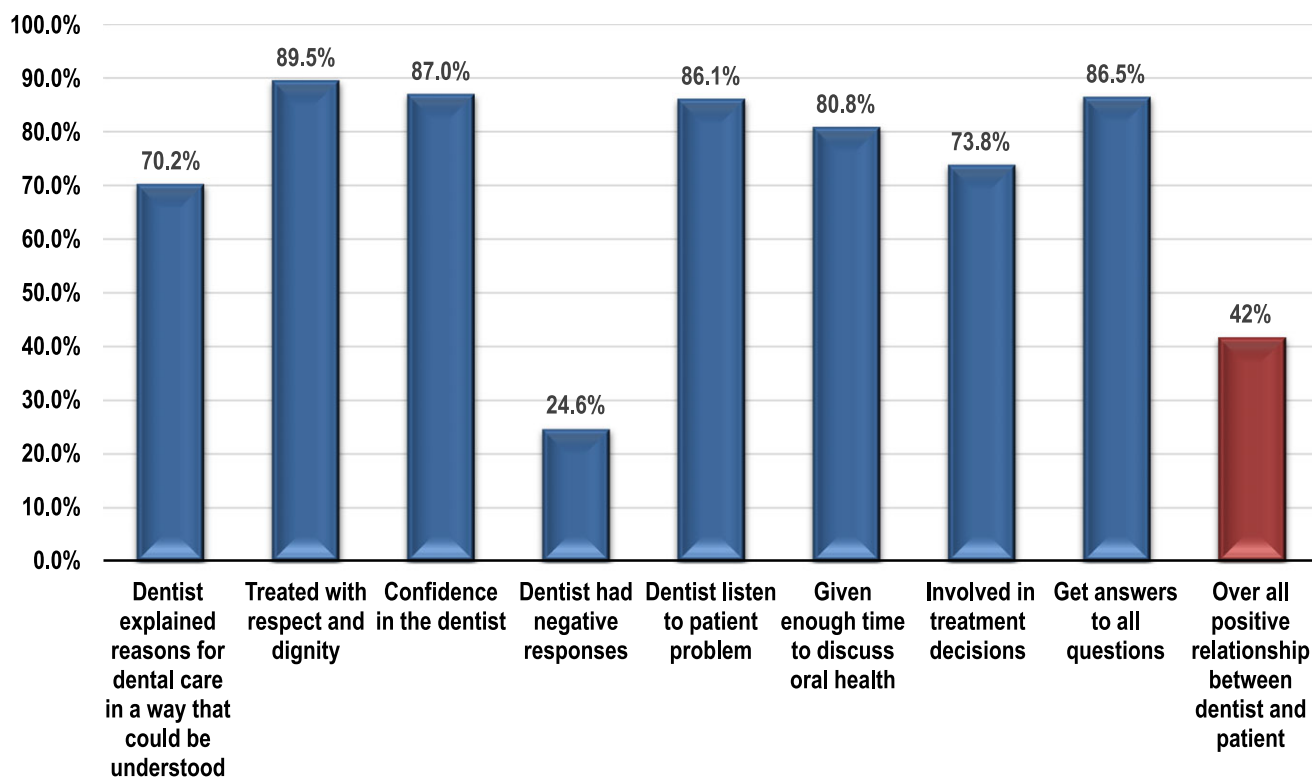


Figure 1. Patient–dentist interactions.

suggests significant differences between the groups. Thus, Dunnett’s test was used for pairwise comparison of the P -values, and it was found that time spent in the waiting area was significantly associated with dental anxiety, in that the significance of this association increased with the waiting time.

The association between the patient–dentist interaction and anxiety is presented in *Table 7*; 70.2% were satisfied that their dentist provided an explanation for their dental care that could be understood by them, and 29.8% reported that their dentist did not provide an explanation of the reasons of their dental care. There was a significant association between dental anxiety and the explanation of the reasons for dental care provided by the dentist ($P < 0.008$; *Figure 1*).

Meanwhile, 24.6% of the participants reported that an adverse behaviour or statement by the dentist increased their dental anxiety, while 86.1% indicated that their dentist listened to them (*Table 7*). The undesirable statements by the dentist had a statistically significant negative impact on dental anxiety ($P < 0.032$). The level of communication by the dentist was also significantly associated with anxiety ($P < 0.008$). Furthermore, being given adequate time to discuss their oral health was also statistically significant ($P < 0.006$).

The variables that were not significantly associated with dental anxiety were being treated with respect

and dignity ($P > 0.199$), the level of confidence in the dentist ($P > 0.413$), the dentist’s ability to listen ($P > 0.115$), being involved in decisions ($P > 0.386$), and obtaining answers that were comprehensible ($P > 0.256$).

DISCUSSION

This study has limitations. The sample was made up of participants attending with a dental problem or for check-up/examination. Also, the data were collected from dental hospitals; therefore it is likely that individuals with high dental anxiety were not included. A random sample population would have been more representative. However, the study design made it possible to obtain information on dental anxiety from a young adult population attending outpatient dental clinics in governmental dental hospitals in Khartoum; these data were not available beforehand.

At the recruitment stage, it was revealed that 9% had never visited a dentist before. In a study in the same region, 22.7% had never visited a dentist, suggesting an inadequate awareness of the importance of oral health¹⁶. Of those with previous dental experience, females were more dentally anxious than males, in agreement with previous studies^{18,21}. However, no gender differences in relation to dental anxiety were observed by Kanegane *et al.*²²

The relationship between the education level and dental anxiety was not significant in the current study, in agreement with Kanegane *et al.*²³ Nevertheless, other studies revealed a significant association of the education level and dental anxiety^{18,24}. It would be difficult to draw comparisons on education levels between countries or regions, given the variable education systems and levels of literacy worldwide.

The absence of regular dental appointments was significantly related to anxiety. Nicolas *et al.*²⁵ reported similar results in French adults. The reason for the previous visit was also significant; some patients delay or seek treatment only when they have a problem^{2–4}. Dental anxiety has been reported to relate to and correlate with the time interval between dental appointments and the previous dental visit²⁶.

In addition, the time lapse since the last visit was significant in this group from Sudan. However, Gaffar *et al.*²⁷ in Saudi Arabia found irregular dental visits not to be related to dental anxiety, while in Jordan, Obeidat *et al.*²⁸ found the fear of the dentist a significant barrier to regular attendance^{27,28}. Similarly, in a Nigerian population, Udoye *et al.*²⁹ suggested avoidance of dental treatment among Nigerians may be related to dental anxiety. The time spent in the waiting area was also significant and was similarly reported by Cohen *et al.*³⁰ It is believed that it leaves the patient time to think what will (or could) happen, and ponder the worst-case scenario³.

Many patients preferred to receive treatment from the same dentist. This is important in the maintenance of care and establishing the patient–dentist relationship⁸. Seemingly, if they prefer attending the same dentist, it is indicative that they were less anxious. Concurrently negative responses or remarks by the dentist tend to make the patient avoid going to a particular dentist, which is in agreement with other studies^{3,11}.

The current study did not find the relationship between soft music and dental anxiety to be statistically significant. However, Walworth³¹ found that music reduced pain and anxiety, particularly when anticipated effects are clearly outlined before the intervention³¹. Also, recently Al-Khotani *et al.*³² reported that audio-visual distraction seems to be a useful tool to decrease dental anxiety during dental treatment³². Nonetheless, Aitken *et al.*³³ found audio distraction not to have reduced anxiety, pain or uncooperative behaviour during paediatric restorative procedures³³. The soft music effects might be subject to cultural influences and backgrounds; the music types are variable between cultures. In this regard, it seems that the preferred music, as opposed to prescribed music, is a critical factor in effectiveness³⁴.

The sight, sound and the vibrational sensation of rotary dental drills are triggers of dental anxiety^{3,11}.

The effects of the sound and smell of dental drills, as well as the voice of patients in pain, on dental anxiety, were also reported in other studies^{35–37}.

The clinic environment, a personal perception, was also significant in relation to dental anxiety. It has been shown to lead to avoidance more than a previously distressing dental experience³⁸.

Patients prefer to take an active role in their treatment³⁹. Hence, time spent discussing oral health was of real significance. This factor, communication skills, and the dental team's behaviour during dental visits increase the likelihood of patients seeking dental care, as well as patient satisfaction⁴⁰. The present study similarly revealed a significant relationship between dental anxiety and the explanation by the dentist of the reasons for dental care, provided that it is comprehensible for them; indicating the importance and significance of communication skills and rapport in the patient–dentist relationship.

Several studies have found that the ability of dentists to respond to and discuss a patient's pain and fear, as well as help them overcome them, was critical to patients' satisfaction, as well as patients' confidence in the skills of their dentist and the quality of care they would provide^{41,42}.

While 74.3% had never had a negative dental experience, they still reported some degree of dental anxiety. It seems that culture, although not evaluated in this study, had an effect, either independently or interacting with other variables, which may have contributed to the variations seen in reports of dental anxiety between regions⁴³. Culture may be a secondary link to this phenomenon, with similarly expressed anxiety in people with similar cultures⁴³. The effects of culture on dental anxiety will be the subject of a future analysis.

This study was intended to be representative of the distribution of the exposure and the outcomes in the general population, to obtain an estimate of the true association. The sample was adequate, had sufficient power, and the random errors, biases or confounding were kept to a minimum; however, a confounding influence is culture as the participants, while they were from the same region, may not share similar cultural influences.

Study limitations are present; however, the authors believe that any potential random error, bias or confounds did not undermine the conclusions to a significant extent. One of these limitations is that the sample was a convenience sample.

The attempt to minimise recall bias was through the use of a widely used, valid and reliable instrument that is brief, with good psychometric properties¹⁹. In addition, it maximises accuracy and completeness, by asking specific questions about the effects of the patient–dentist relationship. It narrows interviewer

bias as it consists of easy to understand closed-end questions with appropriate response options. The interviewers were also trained to strictly adhere to the question and answer format, with the same degree of questioning.

Within the limitation of this study, we concluded that the patient–dentist relationship had a significant impact on dental anxiety. If these are taken into consideration, contributions to improvements in the delivery and standards of oral health care for dentally anxious patients in this region can be achieved.

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Conflict of interest

The authors declare that there are no conflicts of interest.

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