Al-Azhar Journal of Dentistry

Manuscript 1651

Pediatric dentistry and orthodontics Issue (Pediatric Dentistry, Orthodontics)

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Hadeel Elsayed Hamza

Shaymaa Abd Elghffar Elshishiny

Rasha Ibrahim Ramadan

Mohammed Hassan Mostafa

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ORIGINAL STUDY

Prevalence of Behavioral Concerns and Their Impact on Dental Behavior and Anxiety in 4−6-year-old Children Attending Their First Dental Visit

Hadeel E. Hamza [a,*], Shaymaa A.E. Elshishiny [b], Rasha I. Ramadan [a], Mohammed H. Mostafa [b]

[a] Department of Pediatric Dentistry and Dental Public Health, Faculty of Dentistry, Mansoura University, Mansoura, Egypt
[b] Department of Pedodontics and Oral Health, Faculty of Dentistry for Girls, Al-Azhar University, Cairo, Egypt

Abstract

Purpose: To primarily investigate the behavioral concern status among children, both males and females, aged 4−6 years during their first dental visit and to correlate the findings with their cooperative ability. **Patients and methods:** The mothers of the participants were asked to fill the pediatric checklist-17 checklist, consisting of 17 questions assessing the internalizing, attention, and externalizing status of their personality. Children were assessed for dental anxiety using the Raghavendra, Madhuri, Sujata pictorial scale and cooperative ability using the Frankl behavior rating scale (FBRS). All data were collected and analyzed statistically using IBM SPSS software. The total sample included 79 boys and 61 girls comprising 56 and 43 %, respectively, of the participants, respectively. **Results:** Children with behavioral concern totaled 30 children, representing 21.4 % of the total sample. Significant differences were observed between children with and without behavioral concerns in terms of Pediatric Symptom Checklist-17 (PSC-17) temperament scores, Raghavendra, Madhuri, Sujata-dental anxiety scores, and FBRS dental behavior scores and between males and females regarding internalizing, attention, and externalizing PSC-17 subscales' scores. Females were having more internalizing issues compared with males, while males were having more attention and externalizing issues than females. A statistically significant strong negative correlation between average FBRS versus PSC-17 (total) was evident in this study. **Conclusion:** The PSC-17 checklist is a reliable tool for screening children's behavior in the dental office. The prevalence of behavioral concerns among the children in this study was 21.4 %. The behavioral concern status of the participated children impacted their cooperative ability, and there is a strong negative correlation between PSC-17 scores and FBRS scores.

Keywords: Behavior assessment scales, Behavioral problems, Dental anxiety, Dental fear

1. Introduction

Behavior control is crucial in pediatric dentistry because child's actions during a dental procedure have a significant impact on the outcome of the treatment. The theoretical foundations of behavior control have evolved in line with developments in dentistry and human development, thanks to the assistance of psychologists and psychiatrists [1,2].

Numerous elements, such as a child's unique physiology, personality, cognitive features, family, and surroundings, influence their behavior and development. There are probably a number of internal and external causes of dental anxiety. The external cause is frequently defined as a conditioned fear brought on by unfavorable experiences, either direct or indirect, involving dental operations. However, in addition to the individual circumstances, the internal source might be identified as a personality feature or endogenous anxiety [3].

A pediatric dentist must possess good behavior management skills. Finding the elements that lower anxiety and enhance behavior during dental operations is crucial to achieving this. A dentist can create effective behavior management and

Received 6 September 2024; accepted 6 October 2024.
Available online 13 March 2025

* Corresponding author.
E-mail address: hadeelhamza94@hotmail.com (H.E. Hamza).

https://doi.org/10.58675/2974-4164.1651
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treatment plans by having a thorough understanding of child development, causes of dental anxiety, and difficult conduct. The way a youngster reacts to dental work is complicated and depends on numerous variables [4].

Encouraging children to have a positive attitude toward oral health and having a positive impact on their dental well-being during the dental visits is a crucial component of pediatric dentistry. Pediatric dentists need to be adept at both safely handling children's conduct at the dental clinic and effectively assessing it. When analyzing the socio-emotional and behavioral features of children, behavior rating scales are frequently used in a variety of multisource and multimethod frameworks. To effectively treat dental anxiety and terror, pediatric dentists must evaluate and comprehend each child's unique psychological makeup, character qualities, and behavioral responses [5].

A psychosocial screen called the Pediatric Symptom Checklist-17 (PSC-17) is intended to help identify behavioral, emotional, and cognitive issues so that the right kind of interventions can start as soon as feasible. The initial draft was written in English. There are three subscales on the scale: internalizing is a five-question assessment used to gauge how well a person is internalizing issues like depression or anxiety; attention is a five-question test used to assess attentional issues such as attention deficit hyperactivity disorder; and externalizing, is a seven-question assessment focused on externalizing issues such as hyperactivity, violence, and delinquency [6].

The PSC-17 was validated in 2020 by a study led by Ardõc *et al.* [7] as a screening tool for common mental disorders in children in primary care settings. The study comprised 269 kids and teens, aged from 8 to 15 years, whose parents had finished the PSC-1.7. The Kiddie Schedule for Affective Disorders and Schizophrenia for School-Age Children-Present and Lifetime Version (K-SADS-PL) was used to evaluate the children's mental health in greater detail. The PSC-17 results were compared with the findings of this assessment, and the results showed that the PSC-17 was equally useful in diagnosing mental problems in a primary care setting as longer questionnaires, even though it was shorter [7,8].

To manage the behavior of young patients and lessen their fear and anxiety before and during surgery, it is crucial to comprehend dental fear and anxiety in young children. Positive behaviors like smiling and talking can be displayed by children who are at ease and fearless. Conversely, apprehensive kids might act hesitantly or cautiously, and in severe situations, they might even physically defend themselves and interfere with therapy. Understanding the various facets of dental fear and anxiety in pediatric problems in a primary care setting requires the use of appropriate assessment techniques [5].

There are several methods to assess dental fear and anxiety in children. The assessment tools can be categorized into four main types based on the type of informant or the information collected. The assessments include self-report assessment, parental proxy assessment, observation-based assessment such as the Frankl behavior rating scale (FBRS) [9–12] and physiological assessments [5]. However, more advanced methods for measuring dental fear and anxiety in children have been used in research, including questionnaires, pictorial scales, and guided assessments of children's artwork. Pictorial scales, in particular, help younger children who may struggle with answering questions [13].

2. Patients and methods

2.1. Study design and ethical approval

This is a cross-sectional observational study comprising 140 children in the age group of 4–6 years recruited from the dental clinics of Al-Azhar and Mansoura University pediatric dental clinics. The study started after obtaining approval from the Ethics Committee of Faculty of Dentistry Al-Azhar University (Pedo-102-3B).

2.2. Informed parent's consent

Parents approval was attained by signing a letter of agreement for their children to participate after a clear and precise description of the study [10]. Children not participating in the study were treated routinely in the dental clinic.

2.3. Sample size calculation

Sample size (n) was calculated by the following formula [14]:

$$n = \frac{n^{!} \times n \times (1 - n)}{n_{!}}$$

where $Z = Z$ statistic for the level of confidence (1.96 for 95 % confidence level) and P = expected prevalence = 0.10. This prevalence was based on a previous study [15], which reported a prevalence of mental health problems among children younger than 5 years at 10 %. The allowable (acceptable) margin of error was ±5 % ($d = 0.05$). A total sample size of 139 children achieves a 95 % confidence level

for an expected prevalence of 10 % and an acceptable margin of error of ±5 %. The sample size was calculated by using the Power Analysis and Sample Size (PASS) Software (version 15, 2017; NCSS, LLC, Kaysville, Utah, USA).

2.4. Selection of patients

A total of 180 children aged 4–6 years, visiting the dental clinics of Al-Azhar University for Girls and Mansoura University, were examined. One hundred and forty children accompanied by their mothers were finally selected for the study sample. Studied children were recruited according to the following inclusion and exclusion criteria [10].

2.5. Inclusion criteria

(1) Healthy children aged 4–6 years.
(2) The child's first dental visit.
(3) Child patients indicated for dental treatment and or prophylaxis.
(4) The accompanying parent was one of the child's primary caretakers.
(5) The dentist had no previous connection with the child or parent.
(6) The parent was able to understand and respond to the questions.

Children with dental emergencies, such as trauma, acute pulpitis, periapical abscess, and acute periapical periodontitis and children with easily discernible mental limitations or communicative disorders, and children of parents with low educational levels were excluded from the study.

2.6. Materials

PSC-17 [6–8] in English and Arabic translated versions, the Raghavendra, Madhuri, Sujata (RMS) pictorial scale (PS) [13], FBRS [9], an oral examination set, polishing paste, polishing brush, low-speed handpiece (Taurbine, China), fluoride varnish (Fluorodose, USA; Centrix-medical.com.), and data recording sheets for boys and girls were used for the study.

There are 17 items on the PSC-17 (Fig. 1) that have ratings of "never," "sometimes," or "often" present. 0 represents "never," 1 denotes "sometimes," and 2 denotes "often." The sum of the scores for all 17 items is used to determine the final score. When an item is left blank, it is simply disregarded (score = 0). A questionnaire is deemed invalid if four or more of its items are unfilled. Significant emotional or behavioral issues may be present if the PSC-17 score is 15 or higher.

Determine the PSC's three factor scores to ascertain the types of behavioral health issues that are present [8]: the PSC-17 internalizing subscale (cutoff 5 or more items): feels sad "unhappy," feels hopeless, is down on self, seems to be having less fun, worries a lot. The PSC-17 attention subscale (cutoff 7 or more items): fidgety, unable to sit still, daydreams too much, has trouble concentrating, acts as if driven by a motor, distracted easily. The PSC-17 externalizing subscale (cutoff 7 or more items): refuses to share, does not understand other people's feelings, fights with other children, blames others for his/her troubles, does not listen to rules, teases others, takes things that do not belong to him/her [6–8].

The original questionnaire was then translated to Arabic (Fig. 2) by a bilingual native translator with a psychology background. The backward translation was performed by the same translator after 1 week to ensure that the translated version was equivalent to the original version conceptually and linguistically. A consensus version was obtained by conducting a meeting that involved two ordinary persons (two mothers with moderate to high education level) to confirm their proper understanding of the questions of the translated version [16].

RMS-PS [13]: a valid and simple anxiety assessment scale comprises a row of five faces ranging from very happy to very unhappy. Two separate cards of the RMS-PS photographs were used for boys and girls (Fig. 3).

FBRS [9]: the behavior rating scale comprised four behavior categories ranging from definitely negative to definitely positive (Fig. 4).

2.7. Procedures

Psychosocial screening: at first, the PSC-17 psychosocial screening questionnaires were presented to the mothers to assess their ability to understand and respond to the questions (few mothers required assistance to understand the meanings of certain questions). Each mother positively reflected given a questionnaire to answer the questions on behalf of her child to facilitate the recognition of cognitive, emotional, and social problems of concern. Then, they were given an appointment after 3 days, at which and before the clinical sitting she was given another questionnaire to answer the questions for the second time. Intraclass correlation coefficient was calculated for 140 participants and the intraobserver absolute agreement on the assessment of the PSC-17 total score demonstrated excellent absolute agreement [intraclass coefficient (95 % confidence interval) = 0.973 (0.932–0.989), $P < 0.001$] [17].

Pediatric Symptom Checklist-17 (PSC-17)

		Never	Sometimes	Often
1	Feel sad.	0	1	2
2	Feel hopeless.	0	1	2
3	Feel down on him/herself.	0	1	2
4	Worry a lot.	0	1	2
5	Seem to be having less fun.	0	1	2
6	Fidget, is unable to sit still.	0	1	2
7	Daydream too much.	0	1	2
8	Distract easily.	0	1	2
9	Have trouble concentrating.	0	1	2
10	Act as if driven by a motor.	0	1	2
11	Fight with other children.	0	1	2
12	Not listen to rules.	0	1	2
13	Not understand other people's feelings.	0	1	2
14	Tease others.	0	1	2
15	Blame others for his/her troubles.	0	1	2
16	Refuse to share.	0	1	2
17	Take things that do not belong to him her.	0	1	2

Fig. 1. Pediatric symptom checklist.

2.8. Child's dental anxiety assessment

Before the start of the treatment session, children were asked to choose the face that may represent themselves at that moment using the RMS-PS Cards. This was done by choosing a face with a value ranging from 1 (the very happy face) to 5 (the very unhappy face).

2.9. Child's behavior assessment

Calibration for the FBRS scoring criteria was conducted between the investigator and a volunteering postgraduate student colleague. For the confident reliability of the investigator's scoring, the behavior of the first 10 children was rated by two examiners: using the FBRS. This rating was done following the gradual steps of the clinical sitting of the main experiment. The rating was conducted while the child entered the clinic, sat on the dental chair, opened the mouth, had their teeth counted, and during undergoing teeth prophylaxis with fluoride application.

While receiving the children into the clinic and throughout the dental session, verbal and nonverbal communication, along with the tell-show-do behavior management techniques were used as a behavior management protocol for all children [18]. It includes a verbal explanation in a suitable language to the child's understanding, followed by a

"قائمة التحقق من أعراض الأطفال"

الاسم: العمر: النوع (ذكر- أنثى) ت:

	أبدا	أحيانا	دائما	المجموع
١- يميل للحزن؟	0	1	2	
٢- يشعر باليأس بسرعه؟	0	1	2	
٣- يشعر باليأس والضيق عند عدم تحقيق متطلباته؟	0	1	2	
٤- يقلق كثيرا؟	0	1	2	
٥- لا يستمتع بأشيائه؟	0	1	2	
٦- لا يستطيع الجلوس فتره؟ كثير الفرك- متململ؟	0	1	2	
٧- خيالة واسع؟	0	1	2	
٨- يتشتت بسهوله؟	0	1	2	
٩- لديه مشاكل بالتركيز؟	0	1	2	
١٠- كثير الحركة- كما لو كان مدفوعا بمحرك؟	0	1	2	
١١- يتعارك كثيرا مع أصحابه؟	0	1	2	
١٢- لا يسمع الكلام؟	0	1	2	
١٣-لا يفهم مشاعر الآخرين من حوله؟	0	1	2	
١٤- يحب أن يضايق الآخرين؟	0	1	2	
١٥-لا يعترف بخطأة؟	0	1	2	
١٦- يرفض المشاركة؟	0	1	2	
١٧-يحب أن يأخذ أشياء غيره؟	0	1	2	
المجموع				

Fig. 2. The Arabic translated PSC-17. PSC-17, Pediatric Symptom Checklist-17.

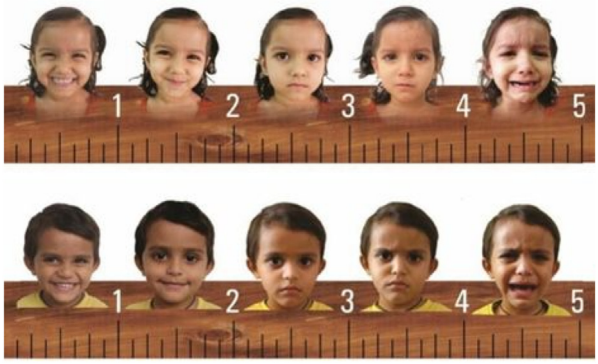

Fig. 3. RMS pictorial scale. RMS, Raghavendra, Madhuri, Sujata.

demonstration of all aspects of the procedure, which was performed immediately without delay.

Using the FBRS, all children were then scored for their behavior during the experimental dental session by the investigator, as the inter-examiner reliability was excellent.

2.10. Dental examination

The clinical dental examination and prophylaxis by the aid of a dental mirror, probe and topical fluoride varnish were conducted to evaluate the dental and oral condition.

The personal data, PSC-17 scores (first-time and second-time scoring), Frankl behavior, and RMS-PSs were manually recorded in a sheet prepared by the investigator.

2.11. Statistical analysis [14]

Data were entered and analyzed using IBM-SPSS software (IBM Corp. Released 2020. IBM SPSS Statistics for Windows, Version 27.0.; IBM Corp., Armonk, New York, USA).

2.12. Data expression

Qualitative data were expressed as *n* (%).

Quantitative data were initially tested for normality using the Shapiro–Wilk test with data being normally distributed if *P* value more than 0.050. The presence of significant outliers (extreme values) was tested for by inspecting box plots.

Quantitative data were expressed as median and interquartile range (Q1 or 25th percentile – Q3 or 75th percentile).

2.13. Data comparison

2.13.1. Qualitative data between groups

The χ^2 test was used to test the association between two nominal variables.

When the expected count in all cells was more than or equal to 5, the χ^2 test was used. Otherwise, Fisher-Freeman-Halton exact test was used.

2.13.2. Quantitative data between two groups

The Mann–Whitney *U* test was used to compare nonnormally distributed quantitative data or ordinal data between two groups.

3. Results

Table 1 illustrates the characteristics of the 140 children participated in the study. It illustrates the categorical characteristics: sex, behavioral concern, RMS pictorial, parent's expectation, and prophylaxis performance scores and percentages. It also illustrates the numerical characteristics, age (years), PSC-17 scale and subscales, and the average FBRS scores.

Of the total sample 79 boys and 61 girls (56 and 43 %, respectively) were involved in the study. Children with behavioral concerns, as calculated from the parents' answers, totaled 30 children representing 21.4 %. They scored 15 or higher on the PSC-17 (they are not diseased but with clinical behavioral concern). Using the RMS-PS, 50 (35.7 %)

Rating	Attitude	Definition
1	Definitely Negative	Refusal of treatment, crying forcefully, fearful. or any other overt evidence of extreme negativism.
2	Negative	Reluctant to accept treatment, uncooperative, some evidence of negative attitude but not pronounced.
3	Positive	Acceptance of treatment; at times cautious, willingness to comply with the dentist, at times with reservation but patient follows the dentist's directions cooperatively.
4	Definitely Positive	Good rapport with the dentist, interested in the dental procedures, laughing and enjoying the Situation.

Fig. 4. Frankl behavior rating scale.

Table 1. Characteristics of the 140 children.

Categorical characteristics	*n* (%)	
Sex		
Male	79 (56)	
Female	61 (43)	
Behavioral concern	30 (21.4)	
RMS pictorial score		
Very happy	50 (35.7)	
Happy	56 (40.0)	
Neutral	25 (17.9)	
Unhappy	9 (6.4)	
Numerical characteristic	Median	Q1–Q3
Age (years)	4.65	4.4–5.08
PSC-17 (internalizing)	2	2–3
PSC-17 (attention)	2	2–3
PSC-17 (externalizing)	2	1–3
PSC-17 (total)	6	5–9
Average FBRS	2.8	1.6–3.2

FBRS, Frankl behavior rating scale; PSC-17, Pediatric Symptom Checklist-17.
Q1–Q3 = 25th–75th percentiles.

children expressed themselves as very happy, 56 (40.0 %) children as happy, 25 (17.9 %) children revealed no true feeling (neutral), and nine (6.4 %) children indicated that they were unhappy.

The median scores for the PSC-17 scale and subscales were 6, Q1–Q3 (5–9), and 2 for the three subscales. The median for the average FBRS was 2.8, Q1–Q3 (1.6–3.2).

Table 2 shows the FBRS scores of the study sample at various stages of the dental visit. Generally, as it is shown in the table, the children's behavior scores improved as the dental session progressed. The number of children with definitely negative and negative scores decreases as the clinical procedure progresses. As shown in the table, the percentage of children with definitely negative and negative behavior while entering the clinic was 25.7 and 28.6 % and reduced to15.7 and 24.3 % during dental prophylaxis. However, percentages of children with positive and extremely positive behavior scores (30.0 and 15.7 %) are increasing by continuation of the clinical procedure (31.4 and 28.6 %).

Table 3 shows the comparison of those with and without behavioral concern for the different studied parameters. Comparisons were done for the categorical and numerical characteristics of the sample.

The behavioral concern group of children chose statistically significantly more higher neutral/unhappy faces using the RMS-PS. However, the happy faces were chosen significantly more by children with no behavioral concern compared with those with behavioral concern. No significant difference

Table 2. Frankl behavior rating scale scores among the study sample during the different steps of dental sitting.

Scores	Entering [*n* (%)]	Sitting [*n* (%)]	Mouth opening [*n* (%)]	Examination [*n* (%)]	Dental prophylaxis [*n* (%)]
Definitely negative	36 (25.7)	33 (23.6)	28 (20.0)	18 (12.9)	22 (15.7)
Negative	40 (28.6)	36 (25.7)	36 (25.7)	41 (29.3)	34 (24.3)
Positive	42 (30.0)	45 (32.1)	47 (33.6)	46 (32.9)	44 (31.4)
Definitely positive	22 (15.7)	26 (18.6)	29 (20.7)	35 (25.0)	40 (28.6)

Table 3. Comparisons of those with and without behavioral concerns regarding the studied parameters.

Characteristics	Behavioral concern				Significance
	Absent [*n* (%)]		Present [*n* (%)]		
Categorical	*N* = 110		*N* = 30		
Sex					0.700
Male	63 (57.3)		16 (53.3)		
Female	47 (42.7)		14 (46.7)		
RMS pictorial score[FFH]					**<0.001**
Very happy	49 (44.5)		1 (3.3)		
Happy	46 (41.8)		10 (33.3)		
Neutral	15 (13.6)		10 (33.3)		
Unhappy	0		9 (30)		
Numerical characteristics	Median	Q1–Q3	Median	Q1–Q3	Significance
Age (years)	4.7	4.4–5.2	4.6	4.4–4.8	0.256
PSC-17 (internalizing)	2	1–2	4	4–7	**<0.001**
PSC-17 (attention)	2	1–2	5	4–7	**<0.001**
PSC-17 (externalizing)	2	1–2	5	4–7	**<0.001**
PSC-17 (total)	6	4–7	16	15–17	**<0.001**
FBRS					
Entering	3	2–3	1.5	1–2	**<0.001**
Sitting	3	2–3	2	1–2	**<0.001**
Mouth opening	3	2–4	2	1–2	**<0.001**
Intraoral examination	3	2–4	2	1–2	**<0.001**
Dental prophylaxis	3	2–4	1.5	1–2	**<0.001**
Average (total)	3	2–3	1.6	1.1–2	**<0.001**

FBRS, Frankl behavior rating scale; PSC-17, Pediatric Symptom Checklist-17.
The tests of significance are χ^2 test and Fisher-Freeman-Halton exact test ([FFH]) for categorical data and Mann–Whitney *U* test for numerical data.
Bold indicate significant P value <0.05.

was noted between the two groups regarding sex and age. Obviously, there were significantly higher PSC-17 scores among children with behavioral concern. Statistically significantly lower FBRS scores (average and domains) were scored for those with behavioral concern compared with those without.

Table 4 shows that PSC-17 internalizing scores were statistically significantly higher in females than in males while PSC-17 attention and externalizing scores were statistically significantly higher in males than in females, with no statistically significant difference in PSC-17 total average score. However, Spearman's correlation coefficient did not show any correlation between FBRS, RMS-P, and PSC-subscale scores in children with behavioral concerns.

As shown in Fig. 5, the scatter plot reveals a statistically significant strong negative correlation between average FBRS versus PSC-17 (total) using Spearman's correlation test (coefficient = −0.730, $P < 0.001$). This indicates that an increase in the PSC-17 score is associated with a lower FBRS score.

4. Discussion

Undoubtedly, the initial dental examination is vital to a child's oral health journey. It is an occasion that can influence a child's attitude toward dental health for years to come and sets the tone for future dental care and treatment. It is a crucial first step in helping the child develop healthy dental habits and gaining comfort and confidence in dental care environments [19].

Dental behavior problems, which may arise in dental offices, are only the outward expression of natural responses triggered by exposure to stressful situations that might induce dental fear and anxiety.

Table 4. Comparison between boys versus girls regarding Pediatric Symptom Checklist-17 subscales of children with behavioral concern (N = 30).

Domain	Boys (*N* = 16)		Girls (*N* = 14)		Significance
	Median	Q1–Q3	Median	Q1–Q3	
Internalizing	4	3–4	7	6.75–7	**<0.001**
Attention	6	4–7	4	4–5	**0.038**
Externalizing	6.5	4.25–8.75	5	4.75–5	**0.038**
Total	16	15–17	16	15–17	0.886

Q1–Q3 = 25th–75th percentiles. The test of significance is Mann–Whitney *U* test.
Bold indicate significant P value <0.05.

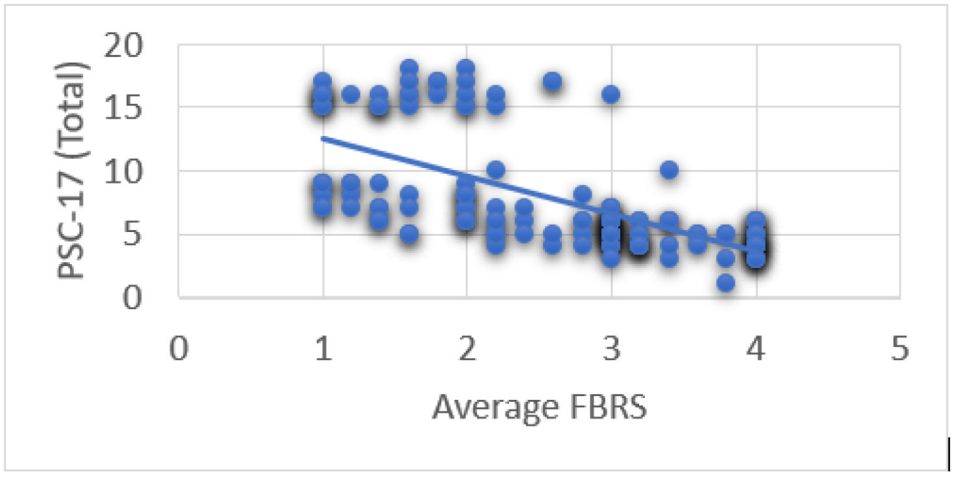

Fig. 5. Scatter plot of FBRS average score versus PSC-17 total score. FBRS, Frankl behavior rating scale; PSC-17, Pediatric Symptom Checklist-17.

Early detection of these problems makes it possible to access efficient, research-backed therapies that can improve a child's emotional and behavioral development [20].

The age of the participating children in this study was 4–6 years. This is consistent with other studies [12,21] and different from others [22,23]. The age disparity across the studies depends on their individual goals. Since many youngsters in the 4–6-year-old age range are probably not dental patients yet, this age range was selected. Younger children's differing responses to dental concern over time may make them less cooperative, and communication bias can flourish more when a child is younger [24]. However, older kids are more likely to get oral care before seeing a dentist, which reduces the likelihood of the initial appointment, which is necessary for the study. In addition, because preschoolers frequently exhibit behavioral issues, the majority of the work currently in publication on the factors influencing dental anxiety and behavior focuses on this age group [25,26].

For many patients, the dentist office is the source of their worry and anxiety [7]. Some children's fear of the dentist may be explained by a traumatic dental encounter in the past combined with elevated dental anxiety in their parents [27]. According to the findings of the Ummat *et al.* [28] study, children's behavior during their first dentist appointment and dental anxiety are related. Others concluded that children with a higher number of dental visits are at increased risk of dental fear and anxiety [10]. In addition, Suresh *et al.* [21] study emphasized how crucial it is to take into account a child's prior experiences as well as the family's dental history when planning and carrying out dental visits, as these elements can have a big impact on a child's cooperation and behavior during dental treatments. Accordingly, in this research we decided to run the study during the first dental visit for the participating children to avoid any previous negative experience that could affect the results. This comes in accordance with other research that conducted similar first dental visit studies [21,22,26].

It was reported that the type of dental procedure can affect a child's behavior. Procedures were categorized as either invasive, requiring local anesthesia, or noninvasive. Pai identified three levels of interventions based on invasiveness and found significant behavioral differences among these levels in children [29].

Given that unpleasant and invasive dental encounters can greatly lead to negative dental experiences, dental prophylaxis was recommended on children's first dental visit. In addition, there is a greater chance of acquiring dental dread during first visits, which often starts in infancy and adolescence. This method promotes improved behavior in kids and helps make the dental office visits less scary. As per the “latent inhibition theory,” youngsters who have had neutral visits such as cleanings and checkups prior before intrusive treatments are less likely to feel terrified. Providing children with sensory information during these visits aids in their ability to control their fear and discomfort, emphasizing the significance of a well-organized first visit in fostering happy, non-traumatic memories [29].

Because it is challenging for scientists to observe children in various settings, psychologists often use questionnaires for parents to describe their children's behaviors, assuming these descriptions are accurate [30]. In this study, we compared the children's characteristics reported by their mothers with

their observed behavior in the clinic, prioritizing actual behaviors over reported ones.

The Checklist (PSC-17) is one of the several screening tests that are available to identify behavioral disorders in children, while not being used in dentistry yet. It is easy to use, costs nothing, and does not require any specialized knowledge to score. During the pediatric consultation, it is advised to assist in identifying cognitive, emotional, and behavioral issues. The PSC has a sensitivity of 0.68 and a specificity of 0.95, according to the authors' reported accuracy [6,7]. The PSC has demonstrated consistent results to detect psychosocial and behavioral problems in different pediatric populations in the United States. Several studies have concluded that the use of PSC-17 offers an approach to the recognition of psychosocial dysfunction that is sufficiently consistent across groups [6–8].

Because of their immature emotional development, evaluating dental fear in younger children is difficult, and it is primarily done through observation of behavior using rating scales rather than surveys [22]. For this reason, the FBRS was used to evaluate fear and anxiety and behavior of children in this study. This measure is frequently used to measure dental anxiety and panic in pediatric dentistry research. It is based on seeing how the child behaves and makes facial expressions when at the dentist. It is thought to be extremely trustworthy for grading kids' conduct during dental appointments. The observer can be the dentist or someone else not involved in the treatment, and the child is not required to respond to any specific questions concerning their fear of the dentist [4,5,12].

Also, a more sophisticated dental fear and anxiety scale, the RMS-PS was used in this study. It is well known that appropriate knowledge of children's anxiety instills confidence and help dentists to review potential management options specific to each child. Pictorial scales, in particular, help younger children who may struggle with answering questions [11,21,31]. In addition to facilitating a positive dental experience and building trust between pediatric dentists, patients, and parents, the RMS-PS provides a quick, easy, and effective way for pediatric dentistry clinics to assess anxiety in their patients. It is also one of the predictive metrics in pediatric dentistry that is most frequently used [21].

The results of this study revealed that 21.4 % of the studied sample have a clinical behavioral concern. This means that these children according to their parents' answers may need further psychological evaluation rather than being considered diseased [6]. This percentage is comparable with the results of Gupta *et al.* [32], Janeshin and Habibi [33], and Anwar *et al.* [10], who used different scales for the prediction of the children's behavior.

Also, this finding was in conformity with previous studies that reported the prevalence of psychiatric problems among children from different community samples all over the world using different behavioral scales between 10 and 20 %, and the preschool age group is most often present with behavior problems [34].

Generalized improvement of children's behavior throughout the dental session, from clinic entry to the prophylaxis, may be explained by the proper communication and the tell-show-do behavior management technique used in this study. This is most probably due to the effect of breaking the ice and soothing behavior following the verbal behavior management techniques [18,20,21]. This outcome is supported by the results of a systematic review, which concluded that all the psychological behavior management techniques aided in reduction of fear and anxiety [4]. Moreover, tell-show-do is a basic method and one of the most commonly used BMTs. This traditional technique aims to establish communication and enhance the evolution of a cooperative child [18]. It has a relaxing effect on anxious children as concluded by Azher *et al.* [35], who reported more relax children after tell-show-do compared with the bubble breath play management technique.

There was no discernible difference in the overall behavioral scale scores between boys and girls, who scored higher than 15 on the PSC-17 behavioral worry scale. The scores on the subscales, however, varied considerably. While the attention and externalizing scores were significantly greater in males than in females, the internalizing score was significantly higher in females. This is consistent with a prior research [32,36] and with Lau et al. [37], who claimed that sex differences in internalizing and externalizing problems are supported by empirical research, showing that men tend to internalize less and externalize more than women, while women tend to internalize more and externalize less than men.

Additional research shows that internalizing and externalizing issues co-occur, particularly in women, which lends credence to the theory that suggests women may have externalizing issues as well, but in a different wat than men. Also, the results of the recent study by Babicka-Wirkus *et al.* [38] showed statistically significant differences in internalizing and externalizing behaviors between boys and girls. However, girls achieved higher scores on most of the Youth Self-Report behavior scales,

including internalizing and externalizing disorders, as well as on the total score.

There was a substantial difference in dental anxiety between the participated children with and without behavior concern. This is consistent with a cross-sectional study finding that shyness and emotional temperaments are linked to higher levels of dental anxiety in both adults and children [39]. Also, it was reported that temper has been shown to influence his/her anxiety levels and coping mechanism [34].

Regarding the dental behavior of the participating children there was a significant difference between those with and without behavior concerns. Also, the PSC-17 and the FBRS scores have a substantial negative association, according to the study's findings. This indicates that the behavior of the participating kids gets worse as the PSC-17 score rises. This could be explained by the underlying causes of behavior that are related to individuals' psychological states toward dental care [31]. Furthermore, it was thought that psychological conditions had a big impact on how kids behaved when receiving dental care [31,40]. Also, it was proposed that temperament is a predictive factor for a child's response to dental treatment especially at young ages [32,36,37,41]. The result of this study are in agreement with Anwar *et al.* [10] and Aminabadi *et al.* [23] as the temperament score increased, the child's behavior rank was lower.

Furthermore, this is consistent with the earlier findings that demonstrated a person's inherited traits as a significant and helpful predictor of a child's behavior in a range of potentially stressful situations. It has also been demonstrated that a child's temperament affects how anxious they are and how they deal with stress [41]. This strong correlation suggests that the temperament PSC-17 scale is a very good tool to predict the child's behavior and is comparable to the temperament SDQ scale's results by Anwar *et al.* [10].

4.1. Conclusion

The inferences achieved from this study are the following:

(1) The PSC-17 checklist is a reliable tool for screening children's behavior in the dental office.
(2) The prevalence of behavioral concern among the children of this study was 21.4 % of the participants.
(3) The behavioral concern status of the participated children negatively impacted their cooperative ability and dental anxiety.
(4) There is a strong negative correlation between PSC-17 scores and FBRS scores.

4.2. Recommendations

(1) Early detection of children with behavior problems in the dental office is recommended to properly managing this category of children.
(2) Screening children's behavior during the first dental visit using the PSC-17 is recommended especially with adequate levels of educated parents.
(3) Psychological assessment and possible cognitive behavior therapy or dental treatment under general anesthesia may be recommended for children with behavioral concern.
(4) Further studies on larger samples are recommended using the PSC-17 checklist in the dental office.

Ethics information

None.

Funding

None.

Biographical information

None.

Conflicts of interest

There are no conflicts of interest.

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