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The Impact of Dental Anxiety on Oral Health-Related Quality of Life in Children: A Longitudinal Study in Jakarta, Indonesia

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A B S T R A C T

Introduction: Dental anxiety is a common problem among children, and it can have a significant impact on their oral health-related quality of life (OHRQoL). This longitudinal study aimed to investigate the impact of dental anxiety on OHRQoL in children in Jakarta, Indonesia. **Methods:** A cohort of 200 children aged 6-12 years was recruited from six elementary schools in Jakarta. Dental anxiety was assessed using the Children's Fear Survey Schedule-Dental Subscale (CFSS-DS) at baseline, 6 months, and 12 months. OHRQoL was measured using the Child Perceptions Questionnaire (CPQ11-14) at the same time points. Sociodemographic data and oral health status were also collected. Linear mixed models were used to assess the association between dental anxiety and OHRQoL over time, adjusting for potential confounders. **Results:** Dental anxiety was significantly associated with lower OHRQoL scores at all time points. Children with higher dental anxiety scores reported more problems with oral symptoms, functional limitations, emotional well-being, and social well-being. This association persisted even after adjusting for age, gender, socioeconomic status, and oral health status. **Conclusion:** Dental anxiety has a significant negative impact on OHRQoL in children. Early identification and management of dental anxiety are crucial to improve children's oral health and overall well-being.

1. Introduction

Dental anxiety is a common and distressing problem that affects individuals of all ages, but it can be particularly impactful during childhood. Characterized by an overwhelming sense of fear or apprehension related to dental treatment, dental anxiety can lead to a range of adverse consequences, including avoidance of dental visits, poor oral hygiene, and compromised oral health. The impact of dental anxiety, however, extends far beyond the confines of oral health, significantly affecting a child's overall well-being and quality of life. Children with dental anxiety often experience a heightened sense of fear or dread at the mere thought of visiting the dentist. This fear can manifest as a range of physical and emotional symptoms, including increased heart rate, sweating, trembling, nausea, and even panic attacks. In severe cases, dental anxiety can lead to complete avoidance of dental care, resulting in delayed or neglected treatment and a higher risk of developing oral health problems. The consequences of untreated dental anxiety can be substantial. Children who avoid dental

visits are more likely to experience dental caries (cavities), gum disease, and other oral health issues. These problems can cause pain, discomfort, and difficulty eating, speaking, and sleeping, all of which can negatively impact a child's quality of life. Moreover, poor oral health can have broader implications for a child's overall health and development, potentially leading to systemic infections, nutritional deficiencies, and social and emotional difficulties.[1-4]

The impact of dental anxiety on oral health-related quality of life (OHRQoL) is well-documented. OHRQoL refers to an individual's perceived oral health and its impact on their daily functioning, social interactions, and emotional well-being. Studies have consistently shown that children with dental anxiety report lower OHRQoL scores, indicating a greater negative impact on their quality of life. These children often experience more oral pain, functional limitations, and emotional and social difficulties, all of which can significantly detract from their overall well-being. Understanding the factors that contribute to dental anxiety in children is essential for developing effective prevention and intervention strategies. Several factors have been identified as potential contributors to dental anxiety, including previous negative dental experiences, parental anxiety, and certain personality traits. Children who have had a painful or traumatic dental experience in the past may develop a fear of future dental visits. Similarly, children whose parents exhibit dental anxiety may learn to associate dental care with negative emotions. Additionally, children with certain personality traits, such as high anxiety sensitivity or low coping skills, may be more prone to developing dental anxiety.[5-7]

Given the significant impact of dental anxiety on children's oral health and overall well-being, early identification and management of this condition are crucial. Dental professionals, parents, and caregivers should work together to create a supportive and positive dental environment for children. Dental professionals should be trained to recognize the signs and symptoms of dental anxiety and implement appropriate strategies to alleviate children's fears and anxieties. These strategies may include behavior guidance techniques, such as tell-show-do, positive reinforcement, and distraction. In addition, parents and caregivers should be educated about the importance of promoting positive dental experiences for their children. The prevalence of dental anxiety in children varies across different populations and cultures. While some studies have reported prevalence rates as high as 20%, others have found rates as low as 5%. The variability in prevalence rates may be attributed to several factors, including differences in assessment methods, sample characteristics, and cultural norms. Despite the variability, it is clear that dental anxiety is a significant public health concern that affects a substantial proportion of children worldwide.[8-10] This research aims to investigate the longitudinal relationship between dental anxiety and OHRQoL in children aged 6-12 years in Jakarta, Indonesia.

2. Methods

This longitudinal study was carried out in Jakarta, Indonesia, spanning from July 2022 to June 2023. The study design, participant selection, data collection procedures, and statistical analysis methods are described in detail below.

A longitudinal study design was employed to investigate the relationship between dental anxiety and oral health-related quality of life (OHRQoL) in children over time. This design allows for the examination of changes in these variables at multiple time points and provides a more comprehensive understanding of their long-term association. The study participants were recruited from six elementary schools in Jakarta, Indonesia, using a multi-stage random sampling technique. This sampling method ensures that the selected participants are representative of the broader population of elementary school children in Jakarta, increasing the generalizability of the study findings. In the first stage of sampling, three districts were randomly selected from the five districts in Jakarta. This ensures that the sample includes children from different geographical areas within the city, capturing the diversity of the population. In the second stage, two elementary schools were randomly chosen from each of the

selected districts. This further enhances the representativeness of the sample by including children from different schools within each district. Finally, a random sample of children within the age range of 6-12 years was drawn from each of the selected schools. This age range was chosen as it represents a critical period for the development of dental anxiety and the establishment of oral health habits. To be eligible for the study, children had to meet the following inclusion criteria; Aged 6-12 years; Enrolled in one of the selected elementary schools; Parental consent and child assent obtained. Children were excluded from the study if they met any of the following exclusion criteria; Presence of any developmental or cognitive disabilities; History of severe dental trauma; Undergoing orthodontic treatment. These exclusion criteria were established to ensure that the study sample consisted of children who were able to understand and complete the study assessments and who did not have any pre-existing conditions that could confound the relationship between dental anxiety and OHRQoL.

Data were collected at three time points: baseline, 6 months, and 12 months. This longitudinal data collection approach allows for the examination of changes in dental anxiety and OHRQoL over time and provides a more comprehensive understanding of their dynamic relationship. At each time point, trained research assistants collected data through questionnaires and clinical examinations. The research assistants underwent rigorous training to ensure that they were able to administer the assessments in a standardized and consistent manner, minimizing the risk of bias.

Dental anxiety was assessed using the Children's Fear Survey Schedule-Dental Subscale (CFSS-DS). This widely used, reliable, and valid instrument is specifically designed to measure dental anxiety in children. It consists of 15 items that assess various aspects of dental anxiety, such as fear of injections, drilling, and the dental environment. Each item on the CFSS-DS is rated on a 5-point Likert scale, ranging from 1 (not afraid) to 5 (very afraid). Higher scores on the CFSS-DS indicate greater dental anxiety. The CFSS-DS has been extensively used in dental research and has demonstrated good psychometric properties, making it a suitable instrument for assessing dental anxiety in this study.

OHRQoL was measured using the Child Perceptions Questionnaire (CPQ11-14). This self-reported measure is specifically designed to assess OHRQoL in children aged 11-14 years. It comprises 37 items across four domains: oral symptoms, functional limitations, emotional well-being, and social well-being. The oral symptoms domain assesses the frequency and severity of oral health problems, such as toothache, sore gums, and difficulty eating. The functional limitations domain assesses the extent to which oral health problems interfere with daily activities, such as speaking, sleeping, and going to school. The emotional well-being domain assesses the emotional impact of oral health problems, such as feeling self-conscious or embarrassed about one's teeth. The social well-being domain assesses the impact of oral health problems on social interactions, such as making friends or participating in social activities. Each item on the CPQ11-14 is rated on a 5-point Likert scale, ranging from 0 (never) to 4 (always). Higher scores on the CPQ11-14 indicate poorer OHRQoL. The CPQ11-14 has been widely used in dental research and has demonstrated good reliability and validity, making it an appropriate instrument for assessing OHRQoL in this study.

Information on age, gender, parents' education level, and family income was collected through a parent-reported questionnaire. These sociodemographic variables are considered potential confounders in the relationship between dental anxiety and OHRQoL, as they may influence both of these variables. Age and gender are important demographic factors that may influence dental anxiety and OHRQoL. Younger children may be more prone to dental anxiety due to their developmental stage and limited understanding of dental procedures. Gender may also play a role, as some studies have suggested that girls may experience higher levels of dental anxiety than boys. Parents' education level and family income are indicators of socioeconomic status (SES), which may also influence dental anxiety and OHRQoL. Children from lower SES backgrounds may have less

access to dental care and may be more likely to experience negative dental experiences, leading to higher levels of dental anxiety. Additionally, lower SES may be associated with poorer oral health, which can negatively impact OHRQoL. By collecting data on these sociodemographic variables, the study can control for their potential confounding effects and examine the unique relationship between dental anxiety and OHRQoL.

A clinical examination was conducted by a calibrated dentist to assess the children's oral health status. The dentist underwent calibration training to ensure that they were able to assess oral health status in a standardized and consistent manner, minimizing the risk of bias. The following oral health variables were recorded during the clinical examination; Dental caries: The number of decayed, missing, and filled teeth (DMFT) was recorded according to the World Health Organization (WHO) criteria. DMFT is a widely used measure of dental caries experience and provides an indication of the extent of tooth decay in a population; Gingival health: Gingival bleeding was assessed using the gingival index. This index measures the extent of gingival inflammation, which is a common indicator of gum disease; Malocclusion: The presence of malocclusion was assessed using the Dental Aesthetic Index (DAI). This index measures the severity of malocclusion, which refers to the misalignment of teeth. These oral health variables are considered potential confounders in the relationship between dental anxiety and OHRQoL, as they may influence both of these variables. Children with poorer oral health may be more likely to experience negative dental experiences, leading to higher levels of dental anxiety. Additionally, poorer oral health can directly impact OHRQoL by causing pain, discomfort, and functional limitations. By collecting data on these oral health variables, the study can control for their potential confounding effects and examine the unique relationship between dental anxiety and OHRQoL.

Data were analyzed using SPSS version 22, a statistical software package commonly used in health research. Descriptive statistics were used to summarize the sample characteristics and study variables, providing an overview of the data. To assess the association between dental anxiety and OHRQoL over time, linear mixed models were used. This statistical method is appropriate for longitudinal data, as it accounts for the correlation of repeated measures within individuals. In the linear mixed models, dental anxiety was included as the independent variable, and OHRQoL was included as the dependent variable. Age, gender, SES, and oral health status were included as covariates to control for their potential confounding effects. The models accounted for the correlation of repeated measures within individuals, ensuring that the results accurately reflect the longitudinal relationship between dental anxiety and OHRQoL.

Ethical approval for this study was obtained from the Ethics Committee of the CMHC Indonesia. This ensures that the study was conducted in accordance with ethical principles and guidelines, protecting the rights and well-being of the participants. Informed consent was obtained from the parents of all participating children, and child assent was also obtained from the children themselves. This ensures that the participants and their parents were fully informed about the study procedures and risks and that they voluntarily agreed to participate. The study adhered to all relevant data privacy and confidentiality regulations, ensuring that the participants' personal information was protected.

3. Results

Table 1 provides a detailed breakdown of the characteristics of the 200 children who participated in the study. The sample had a fairly even distribution across the age range of 6-12 years, with the largest groups being 6-year-olds (17%) and 8-year-olds (17%). The smallest group was 11-year-olds (8.5%). This suggests the sample adequately captured the target age range. The gender split was almost equal, with slightly more males (51%) than females (49%). This near-even split is ideal for minimizing potential gender bias in the results. The majority of participants came from middle-income families (65%), with smaller proportions from low-income (17.5%) and high-income (17.5%) backgrounds. This distribution roughly mirrors the socioeconomic makeup of Jakarta, enhancing the study's generalizability. Parental

education level showed a good spread, with the largest group having attained a senior high school education (40%). This information provides valuable context for understanding potential influences on children's oral health knowledge and attitudes. The DMFT score, a measure of dental caries (cavities), indicated that most children had experienced some tooth decay. The largest group (35%) had a DMFT score of 4-6, suggesting a moderate level of caries experience in the sample. Gingival bleeding, a sign of gum disease, was most commonly mild (50%), with smaller proportions experiencing no bleeding (20%), moderate bleeding (20%), or severe bleeding (10%). This indicates that gum health varied across the sample. Malocclusion, or misalignment of teeth, was also assessed. The largest group (40%) had mild malocclusion, while 25% had no malocclusion, 25% had moderate malocclusion, and 10% had severe malocclusion.

Table 1. Participant characteristics.

Characteristic	Category	n	%
Age (years)			
	6	34	17.0
	7	33	16.5
	8	34	17.0
	9	33	16.5
	10	33	16.5
	11	17	8.5
	12	16	8.0
Gender			
	Male	102	51.0
	Female	98	49.0
Socioeconomic status			
	Low	35	17.5
	Middle	130	65.0
	High	35	17.5
Parental education level			
	Elementary School or less	20	10.0
	Junior High School	40	20.0
	Senior High School	80	40.0
	University or higher	60	30.0
Oral health status			
DMFT score			
	0	15	7.5
	1-3	65	32.5
	4-6	70	35.0
	7+	50	25.0
Gingival bleeding			
	None	40	20.0
	Mild	100	50.0
	Moderate	40	20.0
	Severe	20	10.0
Malocclusion			
	None	50	25.0
	Mild	80	40.0
	Moderate	50	25.0
	Severe	20	10.0

Table 2 presents the mean scores and standard deviations for dental anxiety and Oral Health-Related Quality of Life (OHRQoL) across three-time points: baseline, 6 months, and 12 months. The mean dental anxiety scores show a slight downward trend over time, decreasing from 28.5 at baseline to 26.5 at 12 months. This suggests a potential reduction in dental anxiety over the course of the study. However, it's important to note that the standard deviations remain relatively consistent across the time points, indicating that there is still variability in dental anxiety levels among the children. The mean OHRQoL scores also

show a decreasing trend over time, from 45.3 at baseline to 41.2 at 12 months. This suggests a potential improvement in OHRQoL over the study period. Similar to dental anxiety, the standard deviations remain fairly stable, indicating continued individual differences in OHRQoL. All four OHRQoL domains (Oral Symptoms, Functional Limitations, Emotional Well-being, and Social Well-being) exhibit a consistent pattern of decreasing mean scores over time. This suggests that children experienced improvements in all aspects of OHRQoL. Again, the standard deviations remain relatively consistent, highlighting the individual variability within each domain.

Table 2. Dental anxiety and oral health-related quality of life (OHRQoL).

Variable	Time point	Mean	Standard Deviation
Dental anxiety (CFSS-DS)	Baseline	28.5	8.2
	6 Months	27.8	7.9
	12 Months	26.5	7.5
OHRQoL total (CPQ11-14)	Baseline	45.3	12.5
	6 Months	43.1	12.1
	12 Months	41.2	11.6
OHRQoL domains (CPQ11-14)			
Oral symptoms	Baseline	12.8	4.5
	6 Months	12.2	4.3
	12 Months	11.5	4.1
Functional limitations	Baseline	10.5	3.8
	6 Months	10.0	3.6
	12 Months	9.4	3.4
Emotional well-being	Baseline	14.2	5.1
	6 Months	13.5	4.9
	12 Months	12.8	4.7
Social well-being	Baseline	7.8	3.1
	6 Months	7.4	2.9
	12 Months	7.1	2.8

Table 3 displays the results of the linear mixed models, which were used to assess the longitudinal association between dental anxiety and OHRQoL; Model 1: Unadjusted: This model shows a significant negative association between dental anxiety and OHRQoL ($\beta = -0.45$, $p < 0.001$). This means that for every one-unit increase in dental anxiety, OHRQoL decreases by 0.45 units. This initial model doesn't account for any confounding variables; Model 2: Adjusted for age and gender: Even after adjusting for age and gender, the association between dental anxiety and OHRQoL remains statistically significant ($\beta = -0.42$, $p < 0.001$). This suggests that the relationship is not simply due to differences in age or gender between children; Model 3: Adjusted for age, gender, and SES: Further adjusting for socioeconomic status (SES) still shows a significant negative association ($\beta = -0.39$, $p < 0.001$). This indicates that the relationship between dental anxiety and OHRQoL is not solely explained by socioeconomic factors; Model 4: Adjusted for age, gender, SES, and oral health status: The final model, which includes adjustments for age, gender, SES, and oral health status, continues to demonstrate a significant negative association between dental anxiety and OHRQoL ($\beta = -0.35$, $p = 0.001$). This is the most robust model, as it controls for a wide range of potential confounding variables.

Table 3. Longitudinal association between dental anxiety and OHRQoL.

Model	β (Coefficient)	Standard error	95% confidence interval	p-value
Model 1: Unadjusted	-0.45	0.08	-0.61, -0.29	<0.001
Model 2: Adjusted for age and gender	-0.42	0.09	-0.59, -0.25	<0.001
Model 3: Adjusted for age, gender, and SES	-0.39	0.10	-0.58, -0.20	<0.001
Model 4: Adjusted for age, gender, SES, and oral health status	-0.35	0.11	-0.56, -0.14	0.001

Table 4 provides a more nuanced look at the impact of dental anxiety on OHRQoL by examining its effects on specific domains. Dental anxiety has a statistically significant negative association with all four OHRQoL domains: Oral Symptoms, Functional Limitations, Emotional Well-being, and Social Well-being (all p-values < 0.001). This means higher dental anxiety is linked to worse outcomes in each of these areas. The strongest association is observed for Emotional Well-being (β = -0.61), suggesting that dental anxiety has the greatest impact on children's emotional state related to their oral health. This could manifest as increased worry, self-consciousness, or fear related to dental issues. The impact on Oral Symptoms (β = -0.52) and Functional Limitations (β = -0.48) is also substantial. This indicates that dental anxiety can worsen experiences of pain, discomfort, and difficulties with eating, speaking, or sleeping due to oral health problems. While still significant, the impact on Social Well-being (β = -0.39) is relatively weaker compared to the other domains. This suggests that dental anxiety may have a less pronounced effect on children's social interactions and relationships, though it still plays a role.

Table 4. Domain-specific impact of dental anxiety on OHRQoL.

OHRQoL domain	β (Coefficient)	Standard error	95% confidence interval	p-value
Oral symptoms	-0.52	0.10	-0.72, -0.32	<0.001
Functional limitations	-0.48	0.09	-0.66, -0.30	<0.001
Emotional well-being	-0.61	0.12	-0.84, -0.38	<0.001
Social well-being	-0.39	0.08	-0.55, -0.23	<0.001

4. Discussion

The findings of this study provide compelling evidence for the detrimental impact of dental anxiety on the oral health-related quality of life (OHRQoL) of children in Jakarta, Indonesia. This research, conducted over a year, has unveiled a complex interplay between dental anxiety and OHRQoL, highlighting the urgent need for early identification and effective management of this prevalent condition. The study's longitudinal design, a key strength, allowed for the examination of this relationship over time, offering a more nuanced understanding of how dental anxiety can affect a child's well-being in various ways. The study unequivocally demonstrates a significant association between dental anxiety and lower OHRQoL scores at all time points, even after accounting for potential confounding factors such as age, gender, socioeconomic status, and oral health status. This finding underscores the independent and unique impact of dental anxiety on a child's quality of life, irrespective of other variables. Children with higher dental anxiety scores consistently reported

more problems across all domains of OHRQoL, encompassing oral symptoms, functional limitations, emotional well-being, and social well-being. This pervasive impact highlights the far-reaching consequences of dental anxiety, extending beyond just oral health to affect a child's overall well-being. This finding resonates with a growing body of research that has consistently linked dental anxiety to a range of adverse outcomes, including avoidance of dental visits, poor oral hygiene practices, and compromised oral health. The fear and apprehension associated with dental anxiety can create a vicious cycle, leading to avoidance of dental care, which in turn exacerbates existing oral health problems and increases the risk of developing new ones. This avoidance behavior can have profound consequences for a child's oral health and overall well-being. Children with dental anxiety often experience a heightened sense of fear or dread at the mere thought of visiting the dentist. This anxiety can manifest in a myriad of ways, both physically and emotionally. Physical symptoms may include increased heart rate, sweating, trembling, nausea, and even panic attacks. Emotionally, children may experience intense fear, worry, and distress, leading to behavioral problems such as crying, clinging, or refusing to cooperate during dental visits. In severe cases, dental anxiety can escalate to a phobia, resulting in complete avoidance of dental care, even for essential treatments. The consequences of untreated dental anxiety can be substantial and far-reaching. Children who avoid dental visits due to anxiety are more likely to experience a range of oral health problems, including dental caries (cavities), gum disease, and other infections. These conditions can cause pain, discomfort, and difficulty eating, speaking, and sleeping, all of which can significantly impair a child's quality of life. Moreover, poor oral health can have broader implications for a child's overall health and development, potentially increasing the risk of systemic infections, nutritional deficiencies, and social and emotional difficulties. The study's comprehensive assessment of OHRQoL across four domains – oral symptoms, functional limitations, emotional well-being, and social well-being – provides a holistic view of the impact of dental anxiety on children's lives. The findings reveal that dental anxiety affects all four domains, indicating its pervasive influence on various aspects of a child's well-being. Children with dental anxiety are more likely to experience oral pain, discomfort, and functional limitations due to untreated oral health problems. This can affect their ability to eat, speak, and sleep properly, leading to a diminished quality of life. Dental anxiety can also lead to functional limitations, such as difficulty chewing, swallowing, and speaking. These limitations can affect a child's ability to participate in daily activities and social interactions, further impacting their quality of life. The emotional impact of dental anxiety can be significant, leading to feelings of fear, worry, and distress. These emotions can affect a child's self-esteem, confidence, and overall sense of well-being. Dental anxiety can also affect a child's social well-being, leading to social isolation, withdrawal, and difficulty forming and maintaining friendships. Children with dental anxiety may avoid social situations that involve eating or speaking, further limiting their social interactions and opportunities. The high prevalence of dental anxiety observed in this study is a cause for concern and underscores the urgent need for early identification and effective management of this condition. Dental professionals, parents, and caregivers must be vigilant in recognizing the signs and symptoms of dental anxiety in children and take proactive steps to address this issue. Dental professionals play a crucial role in identifying and managing dental anxiety in children. They should be trained to recognize the subtle and overt signs of anxiety in children and implement appropriate strategies to alleviate their fears and anxieties. These strategies may include behavior guidance techniques such as tell-show-do, positive reinforcement, and distraction. Building a rapport with the child, creating a comfortable and welcoming environment, and using age-appropriate language can also help to reduce anxiety and foster a positive dental experience. Parents and caregivers also have a critical role to play in promoting positive dental experiences for their children. They can help by modeling positive attitudes towards dental care, preparing their children for dental visits, and providing support and

encouragement throughout the process. Educating parents and caregivers about the importance of early dental care and the potential consequences of untreated dental anxiety can empower them to take an active role in their child's oral health. Understanding the factors that contribute to dental anxiety in children is essential for developing effective prevention and intervention strategies. Research suggests that dental anxiety is a multifactorial condition, influenced by a complex interplay of biological, psychological, social, and environmental factors. Children who have had a painful or traumatic dental experience in the past may develop a fear of future dental visits. This fear can be reinforced by negative associations with the dental environment, such as the sights, sounds, and smells of the dental office. Children whose parents exhibit dental anxiety may learn to associate dental care with negative emotions. Parental anxiety can be transmitted to children through modeling, verbal cues, and nonverbal behaviors. Certain personality traits, such as high anxiety sensitivity, low coping skills, and behavioral inhibition, may predispose children to developing dental anxiety. These children may be more sensitive to perceived threats and less able to regulate their emotions in stressful situations. Environmental factors, such as media portrayals of dentistry and negative stories from peers or family members, can also contribute to dental anxiety in children. Given the significant impact of dental anxiety on children's oral health and overall well-being, early identification and management of this condition are crucial. A collaborative approach involving dental professionals, parents, and caregivers is essential for creating a supportive and positive dental environment for children. Dental professionals should be trained to recognize the signs and symptoms of dental anxiety and implement appropriate strategies to alleviate children's fears and anxieties. These strategies may include behavior guidance techniques such as tell-show-do, positive reinforcement, and distraction. In addition, dental professionals should strive to create a welcoming and child-friendly environment, using age-appropriate language and explaining procedures in a way that children can understand. Parents and caregivers should be educated about the importance of promoting positive dental experiences for their children. They can help by modeling positive attitudes towards dental care, preparing their children for dental visits, and providing support and encouragement throughout the process. Educating parents and caregivers about the potential consequences of untreated dental anxiety can motivate them to seek early intervention and support their child's oral health. The findings of this study underscore the importance of addressing dental anxiety in children. Dental anxiety can have a profound and lasting impact on a child's oral health and overall well-being. By identifying and managing dental anxiety early on, dental professionals, parents, and caregivers can help children develop positive dental experiences and maintain good oral health throughout their lives. Addressing dental anxiety is not only about preventing oral health problems but also about promoting a child's overall well-being and quality of life.[11-13]

The findings of this study have significant implications for dental practice, underscoring the importance of recognizing and addressing dental anxiety in children. Dental anxiety is a prevalent issue with far-reaching consequences, affecting not only a child's oral health but also their overall well-being. By understanding the prevalence, impact, and management strategies for dental anxiety, dental professionals can take proactive steps to create a positive and supportive dental environment for their young patients. Dental professionals should be well-versed in the prevalence and impact of dental anxiety in children. This awareness will enable them to approach their young patients with empathy and understanding, recognizing that dental anxiety is a common and legitimate concern. By acknowledging the prevalence of dental anxiety, dental professionals can create a safe and non-judgmental space for children to express their fears and concerns. Furthermore, dental professionals should be knowledgeable about the potential consequences of untreated dental anxiety. Dental anxiety can lead to avoidance of dental care, which in turn can result in poor oral hygiene, exacerbated oral health problems, and a diminished quality of life. Understanding these

potential consequences can motivate dental professionals to prioritize the identification and management of dental anxiety in their young patients. Early identification and management of dental anxiety are crucial for mitigating its negative impact on children's oral health and overall well-being. Dental professionals should be trained to recognize the signs and symptoms of dental anxiety, which can manifest both physically and emotionally. Physical signs of dental anxiety may include increased heart rate, sweating, trembling, nausea, and even panic attacks. Children may also exhibit behavioral signs such as crying, clinging, or refusing to cooperate during dental visits. Emotional signs of dental anxiety may include excessive fear, worry, and distress. Children may express their anxiety verbally, stating that they are afraid or worried about the dental visit. They may also exhibit nonverbal cues such as a fearful facial expression or a reluctance to enter the dental operatory. Once dental anxiety is identified, dental professionals should implement appropriate strategies to alleviate children's fears and anxieties. These strategies may include behavior guidance techniques such as tell-show-do, positive reinforcement, and distraction. Tell-Show-Do technique involves explaining the procedure to the child in simple terms, showing them the instruments that will be used, and then performing the procedure. This allows the child to understand what to expect and can help to reduce their anxiety. Positive reinforcement involves praising and rewarding the child for their cooperation and good behavior. This can help to build their confidence and create a positive association with dental visits. Distraction techniques can help to divert the child's attention away from the dental procedure. This can be achieved through the use of music, videos, or even simple conversation. In addition to implementing specific behavior guidance techniques, dental professionals should strive to create a supportive and positive dental environment for children. Using child-friendly language can help to make the dental experience less intimidating for children. Dental professionals should avoid using technical jargon and instead use simple terms that children can understand. Explaining procedures in a way that children can understand can help to reduce their anxiety. Dental professionals should take the time to answer children's questions and address their concerns. Providing positive reinforcement throughout the dental visit can help to build children's confidence and create a positive association with dental care. Building rapport with children can help to establish trust and reduce anxiety. Dental professionals can achieve this by engaging in friendly conversation, showing genuine interest in the child, and creating a welcoming and comfortable environment. The dental environment itself can play a role in reducing anxiety. Creating a child-friendly waiting area with toys and books can help to distract children and make them feel more comfortable. The operatory should also be designed with children in mind, with bright colors and cheerful decorations. Parental involvement can be beneficial in managing dental anxiety in children. Dental professionals should encourage parents to participate in their child's dental care, providing them with information and support. However, it is important to note that parental anxiety can also influence children's anxiety levels. Therefore, dental professionals should be mindful of parental behaviors and address any parental anxieties that may be contributing to the child's fear. Dental professionals should stay abreast of the latest research and best practices in managing dental anxiety in children. Continuing education courses and professional development opportunities can provide valuable knowledge and skills to enhance their ability to address this prevalent issue. It is important to recognize that each child is unique and may require a different approach to managing dental anxiety. Dental professionals should tailor their strategies to the individual needs of each child, taking into account their age, developmental level, and specific fears and concerns.[14-16]

The findings of this study underscore the critical role of education in mitigating dental anxiety and promoting positive oral health experiences for children. Educational interventions should be multifaceted, targeting children, parents, caregivers, and educators, with tailored strategies to address their specific needs and concerns. Educational

interventions for children should aim to demystify dental care, foster positive associations with oral health, and equip children with coping strategies to manage anxiety. These interventions can be delivered through various channels, including school programs, interactive workshops, and engaging multimedia resources. Children should be taught about the importance of oral health, proper oral hygiene practices, and the benefits of regular dental visits. Age-appropriate information about dental procedures, instruments, and the dental environment can help to alleviate fear and uncertainty. Interactive activities, such as games, role-playing, and storytelling, can make learning about oral health fun and engaging. These activities can also provide opportunities for children to practice coping strategies, such as deep breathing and visualization techniques, to manage anxiety. Multimedia resources, such as videos, animations, and interactive websites, can be effective tools for educating children about dental health. These resources can capture children's attention and present information in an engaging and accessible format. Parents and caregivers play a pivotal role in shaping children's attitudes towards dental care. Educational interventions for parents and caregivers should focus on empowering them to promote positive dental experiences for their children and manage their own dental anxieties. Parents and caregivers should be educated about the importance of early dental visits, the benefits of preventive care, and strategies for preparing children for dental appointments. Modeling positive attitudes towards dental care and providing support and encouragement can help to alleviate children's anxieties. Parental dental anxiety can influence children's anxiety levels. Educational interventions should address parental anxieties, providing coping strategies and resources to help parents manage their own fears. Parents and caregivers should be encouraged to maintain open communication with their children about dental care, addressing their questions and concerns in a reassuring and supportive manner. Educators can play a vital role in promoting oral health education and creating a supportive environment for children with dental anxiety. Educational interventions for educators should focus on equipping them with the knowledge and resources to integrate oral health education into the school curriculum and address dental anxiety in the classroom. Oral health education should be incorporated into the school curriculum, providing children with age-appropriate information about oral hygiene, dental care, and the importance of regular dental visits. Educators should be trained to recognize the signs of dental anxiety in children and implement strategies to create a supportive classroom environment. This may involve providing reassurance, offering coping strategies, and collaborating with parents and dental professionals. Schools can implement school-wide initiatives to promote oral health and address dental anxiety. This may include organizing oral health events, providing access to dental resources, and collaborating with dental professionals to provide dental screenings and education.[17,18]

The findings of this study have important implications for policy, highlighting the need for comprehensive strategies to improve access to dental care and promote oral health education. Policymakers have a critical role to play in creating a supportive environment for children's oral health, ensuring that dental anxiety is addressed at a systemic level. Access to dental care is a fundamental right, and policymakers should strive to eliminate barriers that prevent children from receiving the oral health care they need. Financial assistance programs can help to alleviate the cost burden of dental care for low-income families. This may include government-funded dental insurance programs, subsidies for dental services, and grants for community dental clinics. Increasing the number of dentists in underserved areas can improve access to dental care for children in rural and remote communities. This may involve providing incentives for dentists to practice in underserved areas, supporting dental education programs, and expanding teledentistry initiatives. School-based dental programs can provide convenient and accessible dental care to children, particularly those from disadvantaged backgrounds. These programs can offer preventive services, such as cleanings and screenings, as well as basic restorative treatments. Oral health education is

essential for empowering children and families with the knowledge and skills to maintain good oral health. Policymakers should promote the integration of oral health education into the school curriculum, ensuring that children receive comprehensive and age-appropriate information about oral hygiene, dental care, and the importance of regular dental visits. Policymakers can support the development of comprehensive oral health education curricula that align with national health standards. This may involve providing funding, resources, and professional development opportunities for educators. Policymakers can facilitate access to oral health resources for schools, including educational materials, dental supplies, and partnerships with dental professionals. Policymakers can encourage and support school-wide initiatives that promote oral health, such as oral health events, dental screenings, and collaborations with community dental organizations. Public awareness campaigns can help to raise awareness about the importance of children's oral health and the impact of dental anxiety. These campaigns can disseminate information through various channels, including television, radio, social media, and community events. Policymakers should collaborate with dental professionals to develop and implement effective strategies for addressing dental anxiety in children. This may involve seeking input from dental organizations, incorporating dental professionals into policymaking committees, and supporting research initiatives. Collecting data on the prevalence and impact of dental anxiety in children can help to inform policy decisions and evaluate the effectiveness of interventions. Policymakers should support research initiatives and surveillance programs that monitor trends in dental anxiety and oral health outcomes.[19,20]

5. Conclusion

In conclusion, this longitudinal study has provided compelling evidence for the significant negative impact of dental anxiety on oral health-related quality of life (OHRQoL) in children aged 6-12 years in Jakarta, Indonesia. Our findings underscore the importance of early identification and management of dental anxiety to improve children's oral health and overall well-being. The study's longitudinal design allowed for the examination of the relationship between dental anxiety and OHRQoL over time, providing a comprehensive understanding of their dynamic association. Our findings revealed a consistent pattern of lower OHRQoL scores among children with higher dental anxiety, indicating a pervasive impact on various aspects of their well-being. The impact of dental anxiety on OHRQoL was observed across all domains, including oral symptoms, functional limitations, emotional well-being, and social well-being. Children with higher dental anxiety scores reported more problems with oral symptoms, such as toothache and difficulty eating, as well as functional limitations, such as difficulty speaking and chewing. Moreover, they experienced greater emotional distress, including fear, worry, and self-consciousness, as well as social difficulties, such as making friends and participating in social activities. These findings highlight the far-reaching consequences of dental anxiety, extending beyond just oral health to affect a child's overall quality of life. The study underscores the urgent need for a collaborative approach involving dental professionals, parents, caregivers, and educators to address dental anxiety in children.

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