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DENTAL ANXIETY IN ELEMENTARY SCHOOLCHILDREN: EVALUATING THE ROLES OF AGE AND GENDER AS SIGNIFICANT DEMOGRAPHIC PREDICTORS

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Abstract

Dental anxiety remains a significant challenge in pediatric dentistry, often leading to uncooperative behavior during treatments such as tooth extraction or filling. While global prevalence is high, specific demographic factors like age and gender are thought to play a crucial role in shaping a child's psychological response to dental care. This study aims to evaluate the distribution of dental anxiety levels among elementary schoolchildren, specifically focusing on the influence of age and gender as demographic predictors [5,14]. A descriptive-comparative study with a cross-sectional design was conducted at the SDN Komplek Kampung Manggis, Padang Panjang. The study population consisted of 420 students, with a purposive sample of 145 students (71 males and 74 females) who had prior experience with dental treatment. Data were collected through direct interviews and questionnaires, focusing on anxiety levels during dental procedures. Univariate analysis was employed to describe the frequency distribution of anxiety across the studied variables. The findings revealed a higher prevalence of dental anxiety in female students (38% or 28 students) compared to male students (6% or 4 students). Regarding age, the highest level of anxiety was observed in the 9-10 years age group (35% or 19 students), while the lowest anxiety was found among the oldest group (11-12 years) at 8% (4 students). Age and gender are significant factors in determining dental anxiety levels among schoolchildren. Female students and children in the middle-primary age group (9-10 years) exhibit higher anxiety, suggesting a need for more tailored behavioral management strategies in pediatric dental practice.

Keywords: Dental Anxiety, Elementary Schoolchildren, Age, Gender, Pediatric Dentistry.

1. INTRODUCTION

Health is a holistic state of physical, mental, spiritual, and social well-being that enables individuals to lead productive lives [1]. According to the World Health Organization (WHO) and the Republic of Indonesia Law No. 17 of 2023, health is a fundamental human need regardless of age, gender, or social status [2,3]. Achieving optimal health is the primary goal of public health development, aimed at increasing community awareness and the collective ability to live healthily [1,4]. Within this holistic framework, oral health represents an inseparable component of overall systemic health and plays a significant role in determining a person's quality of life [4]. Maintaining adequate oral hygiene is especially essential in children to prevent dental diseases that could severely interfere with their physical growth, cognitive development, and daily academic activities [6].

Despite its importance, epidemiological data from the Indonesian National Health Research (Riskesdas 2018) indicates that the prevalence of dental and oral health problems in Indonesia

remains alarmingly high, reaching 57.6% [5]. A substantial proportion of these cases involves school-aged children who urgently require professional dental intervention [5,6]. However, when seeking necessary dental treatment, many children encounter significant psychological barriers, primarily manifested as dental anxiety [6,7]. Dental anxiety is defined as a state of apprehension or dread in anticipation of dental procedures [14]. It is frequently triggered by specific exogenous stimuli, such as the sight of dental instruments, the high-pitched sound of the dental drill, or vivid memories of previous traumatic treatments [7,14]. If left unaddressed, this anxiety often leads to uncooperative behaviors in the dental chair, creating substantial obstacles for dental practitioners trying to deliver safe and effective treatment [6,14].

Demographic factors, specifically age and gender, are widely considered crucial predictors of a child's anxiety level [14]. From a developmental standpoint, children's emotional regulation capacities evolve as they grow older, typically resulting in decreased anxiety as they gain better cognitive understanding and behavioral coping skills [6,14]. Furthermore, gender differences often manifest in emotional expression and perception, with female children frequently reporting higher levels of fear and internalizing anxiety symptoms more intensely compared to males [12,13].

Preliminary observations conducted at SDN Komplek Kampung Manggis, Padang Panjang, revealed that a significant number of students still exhibit visible signs of distress and anxiety when faced with routine dental care. Understanding the precise roles of age and gender in this specific population is vital for local dental practitioners to design and apply targeted behavioral management techniques. Therefore, this study aims to evaluate dental anxiety levels among elementary schoolchildren to establish a clearer demographic profile of this psychological phenomenon. To ensure scientific rigor and protect vulnerable participants, this study was conducted in strict adherence to ethical standards, obtaining formal institutional ethical clearance and written informed consent from the participants' parents or legal guardians prior to data collection [8,9].

2. METHODOLOGY

This study employed a quantitative descriptive-comparative approach with a cross-sectional design to evaluate the distribution and predictors of dental anxiety based on specific demographic variables [8,9]. The research was conducted at SDN Komplek Kampung Manggis, Padang Panjang Barat, West Sumatra. This location was chosen based on its representative population of elementary schoolchildren in the urban-suburban transition region. The total baseline population consisted of all active students enrolled at the institution, totaling 420 individuals

A purposive sampling technique was applied to select participants who met the stringent inclusion criteria [9,10]. The inclusion criteria specified students aged 7–12 years who had previously undergone at least one invasive dental treatment, such as a tooth extraction or filling [14]. This prior exposure was mandatory to ensure that respondents could objectively recall and rate their psychological responses to actual dental stimuli. Students whose parents did not provide written informed consent or those who were absent during the data collection period were excluded. Based on these criteria, a final sample size of 145 students (71 males and 74 females) was established [10,11]. While this sampling strategy effectively captured experienced pediatric patients, it is recognized as a study limitation that introduces potential selection bias, as it systematically excludes children without prior dental experience who might exhibit different baseline or anticipatory anxiety profiles [8,10].

The primary instrument for data collection was a structured questionnaire and direct interview guidelines adapted from the Children's Fear Survey Schedule – Dental Subscale (CFSS-DS), a widely validated global standard for measuring pediatric dental anxiety [14]. The adapted questionnaire assessed the severity of psychological distress during various standard dental scenarios, including waiting in the dental office reception, hearing the high-pitched sound of the dental drill, and undergoing local anesthesia injections [7,14]. Respondent reactions were originally scored using a Likert-type scale and categorized into four hierarchical severity levels: low, moderate, high, and very high anxiety [6,14]. However, to increase statistical power, minimize interpretation fragmentation, and achieve optimal analytical clarity, these four categories were subsequently collapsed into a binary outcome variable: "Anxious" (encompassing the

original moderate, high, and very high categories) and "Non-Anxious" (corresponding to the low anxiety category) [11]. To ensure data validity and context appropriateness, the instruments underwent rigorous instrument reliability and validity testing prior to the main data collection phase [9,10].

Data analysis was performed using statistical software to ensure precision [11]. Univariate analysis was first employed to describe the frequency distribution and percentages of the demographic variables (age and gender) and the prevalence of dental anxiety [10]. To evaluate age and gender as significant demographic predictors, bivariate comparative analyses were executed [11]. The statistical significance of differences in anxiety rates between demographic groups was determined using the Pearson Chi-Square (X2) test [9,11]. The alpha level for statistical significance was set a priori at $p<0.05$ [11].

3. RESULTS AND DISCUSSION

1.1 Resut

The total sample analyzed in this study comprised 145 elementary schoolchildren from SDN Komplek Kampung Manggis, Padang Panjang, who met the inclusion criteria. The overall prevalence of dental anxiety within this study population was found to be 22% (n=32), while the remaining 78% (n=113) were categorized as non-anxious.

3.1.1 Dental Anxiety Distribution and Statistical Analysis Based on Gender

The distribution of dental anxiety levels varied substantially between male and female students. As shown in Table 1, the vast majority of male students (94%) reported no anxiety, whereas a significant proportion of female students (38%) exhibited dental anxiety.

Table 1. Distribution of Dental Anxiety Levels Based on Gender

Gender	Sample Size (n)	Anxious (n)	Anxious (%)	Non-Anxious (n)	Non-Anxious (%)
Male	71	4	6%	67	94%
Female	74	28	38%	46	62%
Total	**145**	**32**	**22%**	**113**	**78%**

To evaluate whether gender acts as a significant demographic predictor, a bivariate cross-tabulation with a Pearson Chi-Square test was performed.

Table 2. Chi-Square Significance Analysis by Gender

Variable	Category	Anxiety Rate	X2 Value	p-value	Interpretation
Gender	Male	6%	22.34	**0,001**	**Significant**
	Female	38%			

The statistical testing yielded a p-value of 0.001 ($p<0.05$), demonstrating a highly significant relationship between gender and dental anxiety. Female students were approximately six times more likely to experience dental anxiety than their male counterparts. Further calculation revealed

an Odds Ratio (OR) of 10.20 (95% CI: 3.32–31.33), indicating that female children in this population have ten times higher odds of experiencing anxiety compared to males when undergoing dental procedures [11].

3.1.2 Dental Anxiety Distribution and Statistical Analysis Based on Age Group

The distribution of dental anxiety across the age brackets did not follow a linear progression but instead displayed a distinct peak during middle childhood.

Table 3. Distribution of Dental Anxiety Levels Based on Age Group

Age Group	Sample Size (n)	Anxious (n)	Anxious (%)	Non-Anxious (n)	Non-Anxious (%)
7 - 8 Years	38	9	24%	29	76%
9 - 10 Years	55	19	35%	36	65%
11 - 12 Years	52	4	8%	48	92%
Total	**145**	**32**	**22%**	**113**	**78%**

The highest prevalence of anxiety was observed in the 9–10 years old age group at 35%, whereas the oldest group (11–12 years old) exhibited the lowest prevalence at 8%.

Table 4. Statistical Significance Analysis by Age Group

Variable	Category	Anxiety Rate	X2 Value	p-value	Interpretation
Age Group	**7 - 8** Years	**24%**	**12,28**	**0,004**	**Significant**
	9 - 10 Years	**35%**			
	11 – 12 Years	**8%**			

The Pearson Chi-Square test confirmed that age group is a statistically significant predictor of dental anxiety ($p=0.004$, $p<0.05$). This confirms that the psychological responses to dental treatment vary significantly across different school-aged developmental stages [11]

3.2 Discussion

3.2.1 Gender Dynamics in the Manifestation of Dental Anxiety

The findings indicating a stark contrast in dental anxiety between female (38%) and male students (6%) underscore the pivotal role of gender in a child's psychological perception of dental care. This gender-based disparity can be analyzed comprehensively through the lens of Emotion Socialization Theory [12]. Culturally and socially, female children are frequently raised in environments that are more permissive of expressing vulnerability, distress, and fear [12,13]. Conversely, male children are systematically conditioned to internalize their fears and suppress behavioral expressions of anxiety to conform to traditional social constructs of "bravery" and masculinity [13]. Consequently, male students may underreport their anxiety levels during direct interviews and questionnaires.

Beyond psychosocial factors, the pronounced anxiety among females may also be linked to variations in the biological pain threshold [12]. Clinical literature suggests that females often demonstrate heightened sensitivity to tactile and painful sensory stimulation within the oral cavity [7,14]. Within the clinical framework of school-based dental programs, this vulnerability

mandates a shift from generalized approaches to highly customized interventions [4]. Dental practitioners must prioritize non-pharmacological behavioral management, specifically the "Tell-Show-Do" protocol [6]. This should be augmented with explicit positive reinforcement to establish a supportive environment and build baseline psychological safety before commencing any invasive treatments [6,14].

3.2.1 Fluctuations in Anxiety Based on Cognitive Development Stages

The non-linear curve of dental anxiety—which rises from 24% at ages 7–8, peaks sharply at 35% at ages 9–10, and declines to 8% at ages 11–12—presents a compelling developmental pattern [14]. This trajectory closely corresponds with Jean Piaget's stages of cognitive development [6].

- Ages 7–8 Years (Early Concrete Operational Stage): Children at this stage typically display a generalized form of anxiety [14]. Their fear is not necessarily directed toward technical dental mechanics but is primarily driven by exogenous factors like the "fear of the unknown" or separation from parental figures [6,7].
- Ages 9–10 Years (The Critical Transition): This stage marks a peak in imaginative capacity combined with partial cognitive awareness [14]. Children at this age fully comprehend the concept of medical risk and potential bodily harm (e.g., "bleeding" or severe "pain"), often reinforced by vicarious learning from negative peer stories or their own past memories [7,14]. However, because their emotional self-regulation and logical coping mechanisms are not yet fully matured, they experience an escalation of proactive anticipatory anxiety [6,14].
- Ages 11–12 Years (Cognitive Maturity): The dramatic drop in anxiety to 8% signifies the transition toward formal operational thinking [6]. Preadolescents possess superior logical reasoning and self-regulation skills, enabling them to contextualize that transient dental discomfort is fundamentally necessary for long-term health benefits [6,14]. Furthermore, repeated positive exposure over time yields a habituation effect, reducing the dental clinic environment from a primary psychological threat to a routine event [14].

3.2.3 Clinical Implications for Behavioral Management

The empirical evidence from this study demonstrates that pediatric dental anxiety cannot be effectively managed with a "one-size-fits-all" clinical model [14]. Management must be demographic-centered, actively accounting for the patient's gender and exact age bracket [12,14]. For female patients and children navigating the high-risk 9–10 year transition phase, the incorporation of advanced distraction techniques—such as audio-visual aids, music therapy, or interactive digital media—is highly recommended to actively divert cognitive focus away from threatening sensory stimuli like the sound of the drill [6,7].

Ultimately, long-term prevention must focus on establishing early, positive dental habits [4]. Preventing early childhood dental trauma is crucial, as early negative experiences serve as a primary catalyst for severe "dental avoidance"behaviors that persist into adulthood, causing long-term deterioration of public oral health [6,14].

- For Female and 9–10 Year-Old Patients: The use of distraction techniques (such as listening to music or watching videos) is highly recommended to divert focus from the sound of the drill or sharp instruments [7].
- Long-term Prevention: Continuous dental health education is essential to ensure that a child's first dental experience is positive. Traumatic experiences at a young age can lead to "dental avoidance" patterns in adulthood.

Practitioners must move away from a "one-size-fits-all" approach and instead adopt a demographic-centered approachto minimize psychological barriers and increase treatment success rates.

4. CONCLUSIONS AND RECOMMENDATIONS

1.2 Conclusions

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Based on the empirical findings and subsequent analysis regarding dental anxiety among elementary schoolchildren, the following conclusions can be drawn:

1. Gender as a Dominant Predictor: Gender exhibits a highly significant correlation with pediatric dental anxiety (p=0.001). Female students demonstrate a profoundly higher prevalence of anxiety (38%) compared to male students (6%), confirming that gender is a critical demographic determinant of a child's emotional response to dental care [12,13].
2. Non-Linear Age-Anxiety Trajectory: Age group is a statistically significant predictor of dental anxiety (p=0.004) but does not follow a linear progression. Anxiety peaks significantly during middle childhood at ages 9–10 years (35%) and drops drastically to its lowest level at ages 11–12 years (8%) as children achieve higher cognitive maturity [14].
3. High High-Risk Prevalence: The overall prevalence of dental anxiety within this study population stands at 22%. This highlights that nearly one-fourth of the school-aged population requires targeted, specialized behavioral intervention during dental treatments [5,6].

1.3 Limitations of the Study

This study acknowledges certain limitations. The use of a purposive sampling strategy that strictly included children with prior dental treatment experience introduces a potential selection bias [10]. Consequently, the baseline and anticipatory anxiety profiles of children who have never undergone any dental procedures remain unexamined in this research [8,10].

1.4 Recommendations

1. For Dental Practitioners: Clinicians must transition away from a standardized management model and adopt a demographic-centered approach [14]. Tailored non-pharmacological behavioral management strategies, such as the "Tell-Show-Do" technique and active audio-visual distraction, should be heavily prioritized for female patients and children within the 9–10 age bracket [6,12].
2. For Institutional Dental Programs: Schools and parents are highly encouraged to facilitate early, non-invasive dental visits [4]. Early habituation reduces the "fear of the unknown" and fundamentally prevents the development of chronic dental avoidance behaviors in adulthood [6,14].

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