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Prevalence and Risk Factors of Dental Caries in Pediatric Patients: A Clinical Examination-Based Study in a Dental and Oral Hospital

Puji Kurnia[1*], Deli Mona[1], Mifthahul Khoir[1], Rossyqoh Durrotul[1], Surya Arsyiah[1]

[1]Faculty of Dentistry, Universitas Andalas, Padang, Indonesia

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***Corresponding author:**
Puji Kurnia

E-mail address:
pujikurniakerja@gmail.com

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A B S T R A C T

Dental caries remains a significant public health concern globally, with a high prevalence among children in Indonesia. The consequences of untreated caries extend beyond oral health, impacting children's overall well-being and quality of life. This study aimed to determine the prevalence and risk factors of dental caries in pediatric patients visiting the Dental and Oral Hospital of Universitas Andalas (RSGM Unand). A cross-sectional study was conducted at RSGM Unand in 2023. A total of 27 pediatric patients, aged 6 to 10 years, were recruited using total sampling. A caries risk assessment was performed using a questionnaire and clinical examination based on the Caries Management by Risk Assessment (CAMBRA) protocol. Data collected included demographic information (age, gender), and caries risk factors identified through the CAMBRA questionnaire and clinical examination. The collected data were analyzed using SPSS software. The study population consisted of 27 children, with a higher proportion of females (59.3%) than males (40.7%). The age distribution showed the highest number of participants were 6 years old (25.9%). The overall prevalence of high caries risk among the studied pediatric patients was 88.9%. A higher percentage of females (87.6%) were categorized as having high caries risk compared to males (90.0%). Among different age groups, children aged 7, 8, and 10 years showed a 100% prevalence of high caries risk. In conclusion, the findings of this study indicated a very high prevalence of caries risk among pediatric patients visiting RSGM Unand. This highlights the urgent need for targeted preventive and management strategies for dental caries in this population. Further research with a larger sample size and the inclusion of a wider range of risk factors is recommended to gain a more comprehensive understanding of the caries burden in this region.

1. Introduction

Dental caries, commonly known as tooth decay, is a chronic disease characterized by the demineralization of tooth enamel and dentin. This deterioration of the tooth structure is a result of acid production by bacteria present in dental plaque. The process is primarily fueled by the metabolism of dietary sugars by oral bacteria, which leads to the formation of acids. These acids, over time, erode the tooth structure. Dental caries stands as one of the most prevalent chronic diseases affecting both children and adults on a global scale. The ramifications of untreated caries extend beyond the oral cavity, significantly impacting overall health and well-being. Untreated caries can lead to a range of detrimental consequences, including pain, infection, tooth loss, and difficulties in essential functions such as chewing and speaking. In children, the impact of untreated caries is particularly severe, potentially resulting in impaired nutrition, growth retardation, sleep disturbances, and a diminished quality of life. Furthermore, the presence of dental caries in primary dentition has been associated with an elevated risk of caries development in permanent teeth, highlighting

the long-term implications of early childhood caries. The economic burden associated with dental caries is also substantial. This burden encompasses the costs of treatment, preventive measures, and lost productivity due to the disease.[1-3]

Epidemiological studies have consistently demonstrated a high prevalence of dental caries among children in Indonesia. Data from the 2018 Basic Health Research (Riskesdas) revealed a significant increase in caries prevalence among children aged 5-9 years, reaching 92.6% compared to 25.9% in 2013. Among children aged 10-14 years, the prevalence was also high at 73.4%. These figures highlight the urgent need for effective strategies aimed at the prevention and management of dental caries within the pediatric population. The Sumatera Barat province, the location of Universitas Andalas, also reported elevated caries rates, with 51% of children aged 5-9 years and 42% of children aged 10-14 years being affected. The development of dental caries is a complex process influenced by a multitude of factors. It involves the interplay of biological, behavioral, and environmental elements. Key risk factors that contribute to the initiation and progression of dental caries include high frequency of sugar consumption, the presence of visible plaque, low salivary flow rate, the presence of orthodontic appliances, certain underlying medical conditions, inadequate access to dental care, various socio-demographic factors, and the presence of cariogenic microorganisms within the oral cavity. Addressing these risk factors is crucial for the effective prevention of the disease. The Ministry of Health of the Republic of Indonesia has set a national goal of achieving a caries-free Indonesia by 2030, with the aim of ensuring that children aged 12 years are free from dental caries. In pursuit of this ambitious target, various preventive efforts are being implemented, including the assessment of caries risk in children. The identification of children at high risk is essential as it allows for the implementation of targeted interventions and the development of personalized preventive strategies, aimed at preventing further disease progression.[4-7]

The Caries Management by Risk Assessment (CAMBRA) is an evidence-based approach to preventing and managing dental caries in individuals. It focuses on intervening at the earliest stages of the disease process. This methodology aids dental professionals in identifying the underlying causes of caries development by evaluating individual risk factors and protective factors. Based on the comprehensive risk assessment provided by CAMBRA, clinicians are equipped to develop tailored treatment plans. These plans may include behavioral modifications aimed at reducing risk, the use of chemical interventions to manage the disease process, and the application of non-invasive procedures, all focused on managing identified risk factors and promoting optimal oral health. Given the high prevalence of dental caries among Indonesian children, and the established importance of early risk assessment for effective management of the disease, this study was conducted.[8-10] It aimed to investigate the prevalence and risk factors of dental caries in pediatric patients visiting the Dental and Oral Hospital of Universitas Andalas (RSGM Unand).

2. Methods

This study adopted a cross-sectional design. The research was conducted at the Dental and Oral Hospital of Universitas Andalas (RSGM Unand), located in Padang, Indonesia. The data collection for the study took place during the year 2023. The study population consisted of pediatric patients who were between the ages of 6 and 10 years old. These children were individuals who visited RSGM Unand for the purpose of receiving dental and oral health care services. The sample size for this study was comprised of 27 participants. The recruitment of these participants was carried out using a total sampling technique. This sampling method involved inviting all pediatric patients within the specified age range who

presented at the hospital during the study period and fulfilled the inclusion criteria to participate in the research. The inclusion criteria for participation in the study were as follows; The participant had to be a pediatric patient within the age range of 6 to 10 years; The participant was visiting RSGM Unand to receive routine dental care or treatment; Informed consent to participate in the study was provided. Exclusion criteria were applied to ensure the integrity of the study. Patients with systemic diseases or conditions that had the potential to significantly affect their oral health were excluded from participation.

Data collection for this study involved the utilization of both a questionnaire and a clinical examination. These tools were structured based on the Caries Management by Risk Assessment (CAMBRA) protocol. The specific instruments employed in the data collection process included; Informed Consent Form: A written informed consent form was utilized. This form was provided to the parents or legal guardians of the pediatric patients who were eligible to participate in the study. The informed consent form served the purpose of explaining the study in detail. It outlined the purpose of the study, the procedures that would be involved, and the rights that the participants held; CAMBRA Caries Risk Assessment Questionnaire: A structured questionnaire was employed to gather information pertaining to various caries risk factors. This questionnaire was adapted from the standard CAMBRA form. The questionnaire included inquiries related to the child's dietary habits, with a focus on the frequency of sugary food and beverage consumption. It also covered aspects of their oral hygiene practices, such as the frequency and method of toothbrushing, and the use of fluoride toothpaste. Additionally, the questionnaire explored the child's fluoride exposure, including the use of fluoride mouthwash or supplements. The questionnaire also assessed clinical conditions such as the presence of visible plaque, the occurrence of gingival bleeding, and the presence of dry mouth. Furthermore, the questionnaire included questions regarding relevant behavioral factors. The questionnaire was administered to the parents or guardians of the children through a face-to-face interview; Clinical Examination Form: A standardized clinical examination form was utilized. This form was based on the CAMBRA protocol and was used to record the findings obtained from the oral examination. The clinical examination included an assessment of plaque accumulation, evaluation of gingival inflammation, determination of the presence of existing caries, assessment of the presence of restorations, and documentation of any other pertinent clinical findings. The clinical examination was carried out by a dental professional who had received specific training and calibration for this purpose. The examination was conducted using sterile dental instruments, including a dental mirror, a probe, and an explorer, under appropriate lighting conditions.

The data collection process was carried out through the following sequence of steps; Recruitment and Consent: The process began with the recruitment of eligible pediatric patients and their parents or guardians. These individuals were approached in the waiting area of the pediatric dentistry clinic at RSGM Unand. A detailed explanation of the study was provided to them. Written informed consent was obtained from the parents or guardians of the children prior to their participation in the study; Questionnaire Administration: Following the procurement of informed consent, the parents or guardians were invited to participate in a face-to-face interview. The purpose of this interview was to complete the CAMBRA caries risk assessment questionnaire. A trained research assistant conducted the interview, guiding the parents or guardians through the questionnaire to ensure clarity and completeness in their responses; Clinical Examination: Subsequent to the questionnaire administration, the pediatric patients underwent a comprehensive clinical oral examination. This examination was conducted while the patient was seated in a dental chair. The examination was

performed by a dental professional who had been calibrated for the procedure. This professional was also blinded to the responses that had been provided in the questionnaire. The findings derived from the clinical examination were meticulously recorded on the standardized clinical examination form; Data Recording: All data that were collected, whether from the questionnaires or the clinical examinations, were carefully recorded. These records were stored securely to maintain confidentiality. Each participant in the study was assigned a unique identification number, further ensuring the maintenance of confidentiality.

Following the collection of information through the questionnaire and the clinical examination, each participant was assessed to determine their level of caries risk. Participants were categorized into one of three risk levels: low, moderate, or high. This categorization process was conducted in accordance with the CAMBRA protocol. The categorization was based on an evaluation of the balance between pathological factors and protective factors. Pathological factors included elements such as the presence of caries, frequent intake of sugar, and inadequate oral hygiene practices. Protective factors included elements such as fluoride exposure and adequate salivary flow.

The data collected during the study were entered into and analyzed using the Statistical Package for the Social Sciences (SPSS) software. Descriptive statistics were employed to summarize the data. Frequencies and percentages were calculated to describe the demographic characteristics of the study participants and the prevalence of the different caries risk levels observed in the study. Cross-tabulations were generated to examine the distribution of caries risk levels in relation to age and gender.

This study was conducted with adherence to the ethical principles set forth in the Declaration of Helsinki. Ethical approval for the study was granted by the Research Ethics Committee of the Faculty of Dentistry, Universitas Andalas. Informed consent was obtained from the parents or legal guardians of all children who participated in the study. This informed consent was procured prior to their inclusion in the research. Throughout the entire study, the confidentiality and anonymity of the participants were rigorously maintained.

3. Results and Discussion

Table 1 presents the gender distribution of the participants included in the study. It provides a breakdown of the number (n) and percentage (%) of participants categorized as either male or female, as well as the total count. The table clearly demonstrates that there was an unequal representation of genders within the study sample. The female group comprised a larger portion of the study population compared to the male group. Specifically, 16 out of the 27 participants were female. In terms of percentages, 59.3% of the participants were female, while 40.7% were male. This shows that females made up nearly 60% of the sample, indicating a notable difference of approximately 18.6 percentage points between the two gender groups. The table also confirms the total sample size of the study. There were 27 participants in total, which is consistent with the methods section that stated a sample size of 27. The percentages add up to 100%, confirming that all participants were accounted for within the male and female categories.

Table 1. Distribution of characteristics by gender.

Gender	Number (n)	Percentage (%)
Male	11	40.7
Female	16	59.3
Total	27	100.0

Table 2 presents the age distribution of the participants in the study. It shows the number (n) of participants at each age from 6 to 11 years, along with the corresponding percentage (%) for each age group, and the total counts. The table shows the distribution of participants across a relatively narrow age range, from 6 years old to 11 years old. This aligns with the methods section specifying an age range of 6 to 10 years, with 11-year-olds also included in the data. The age group with the highest number of participants is 6 years old, with 7 children representing 25.9% of the total sample. This indicates that the youngest age group in the study was the most represented. There's a general trend of decreasing participant numbers as the age increases from 6 to 8 years, with 7 participants at age 6, 5 at age 7, and 4 at age 8. The distribution shows some fluctuation. The number of 9-year-olds increases slightly to 5, but then drops to the lowest count of 2 for 10-year-olds. The number increases slightly again to 4 for the 11-year-olds. The older age groups (10 and 11) have the lowest representation. The distribution of participants across the ages is uneven, with younger ages having higher representation compared to older ages. The table confirms that the total sample size is 27, consistent with Table 1 and the methods section. The percentages accurately reflect the proportion of each age group within the total sample, summing up to 100%.

Table 2. Distribution of characteristics by age.

Age (Years)	**Number (n)**	**Percentage (%)**
6	7	25.9
7	5	18.5
8	4	14.8
9	5	18.5
10	2	7.4
11	4	14.8
Total	**27**	**100.0**

Table 3 presents the distribution of caries risk levels among the study participants. It categorizes the participants into three risk levels: Low, Moderate, and High, and shows the number (n) and percentage (%) of participants falling into each category, as well as the total counts. The most striking finding in this table is the overwhelming prevalence of high caries risk among the participants. A large majority of the participants, 24 out of 27, were classified as having a high risk of developing dental caries. This high-risk group represents 88.9% of the total sample. This percentage underscores the substantial burden of caries risk within this study population. In stark contrast to the high-risk group, the low and moderate risk categories have very few participants. Only 1 participant (3.7%) was classified as having low caries risk, and only 2 participants (7.4%) were classified as having moderate caries risk. The distribution of caries risk is highly disproportionate, with a very large concentration in the high-risk category and very few individuals in the other two categories. The table confirms that the total sample size is 27, consistent with the previous tables. The percentages accurately reflect the proportion of participants in each caries risk category within the total sample, summing up to 100%.

Table 3. Caries risk assessment.

Caries risk	Number (n)	Percentage (%)
Low	1	3.7
Moderate	2	7.4
High	24	88.9
Total	**27**	**100.0**

Table 4 presents a cross-tabulation of caries risk levels by gender. It shows the number (n) and percentage (%) of participants within each gender category (Male and Female) who fall into each caries risk category (Low, Moderate, and High). It also provides the total number and total percentage for each gender and for the overall caries risk distribution. The table separates the data by gender, allowing for a comparison of caries risk distribution between males and females. Within each gender, the participants are further categorized into Low, Moderate, and High caries risk levels; Male Caries Risk Distribution: There were no males in the Low caries risk category (0 participants, 0.0%). 1 male participant was in the Moderate caries risk category (10.0%). 10 male participants were in the High caries risk category (90.0%); Female Caries Risk Distribution: 1 female participant was in the Low caries risk category (6.2%). 1 female participant was in the Moderate caries risk category (6.2%). 14 female participants were in the High caries risk category (87.6%). Both males and females show a high prevalence of high caries risk. 90.0% of males and 87.6% of females were classified as high risk. The percentage of males with high caries risk (90.0%) is slightly higher than the percentage of females with high caries risk (87.6%), although the difference is relatively small. Females had representation in both Low and Moderate risk categories, while males had representation only in the Moderate risk category. The percentage of females in the Low and Moderate categories was the same (6.2% each). The "Total" section of the table reiterates the overall caries risk distribution for the entire sample, consistent with Table 3: 1 Low (3.7%), 2 Moderate (7.4%), and 24 High (88.9%). The table confirms the total number of males (11) and females (16), as well as the overall total (27), consistent with previous tables. The table confirms that the percentages for each gender add up to 100%.

Table 4. Frequency distribution of caries risk by gender.

Gender	Caries risk	Number (n)	Percentage (%)	Total number	Total percentage (%)
Male	Low	0	0.0	11	100.0
	Moderate	1	10.0		
	High	10	90.0		
Female	Low	1	6.2	16	100.0
	Moderate	1	6.2		
	High	14	87.6		
Total	Low	1	3.7	27	100.0
	Moderate	2	7.4		
	High	24	88.9		

Table 5 presents a cross-tabulation of caries risk levels by age. It shows the number (n) and percentage (%) of participants within each age group (from 6 to 11 years) who fall into each caries risk category (Low, Moderate, and High). It also provides the total number and total percentage for each age group and for the overall caries risk distribution. The table allows for an age-specific analysis of caries risk distribution, providing insights into how caries risk varies across different ages within the study sample. Within each age group, participants are categorized into Low, Moderate, and High caries risk levels; Age 6 Caries Risk Distribution: No participants aged 6 were classified as Low risk (0 participants, 0.0%). 1 participant aged 6 was classified as Moderate risk (14.0%). 6 participants aged 6 were classified as High risk (86.0%); Age 7 Caries Risk Distribution: All participants aged 7 were classified as High risk (5 participants, 100.0%). No participants aged 7 were classified as Low or Moderate risk (0 participants, 0.0%); Age 8 Caries Risk Distribution: All participants aged 8 were classified as High risk (4 participants, 100.0%). No participants aged 8 were classified as Low or Moderate risk (0 participants, 0.0%); Age 9 Caries Risk Distribution: No participants aged 9 were classified as Low risk (0 participants, 0.0%). 1 participant aged 9 was classified as Moderate risk (20.0%). 4 participants aged 9 were classified as High risk (80.0%); Age 10 Caries Risk Distribution: All participants aged 10 were classified as High risk (2 participants, 100.0%). No participants aged 10 were classified as Low or Moderate risk (0 participants, 0.0%); Age 11 Caries Risk Distribution: 1 participant aged 11 was classified as Low risk (25.0%). No participants aged 11 were classified as Moderate risk (0.0%). 3 participants aged 11 were classified as High risk (75.0%). High caries risk is prevalent across all age groups, with several age groups (7, 8, and 10) showing 100% of participants classified as high risk. Moderate risk is observed in some age groups (6 and 9), but not in others. Low risk is only observed in the 11-year-old group. The "Total" section of the table reiterates the overall caries risk distribution for the entire sample, consistent with Table 3 and Table 4: 1 Low (3.7%), 2 Moderate (7.4%), and 24 High (88.9%). The table confirms the total number of participants in each age group and the overall total (27), consistent with previous tables. The table confirms that the percentages for each age group add up to 100%.

Table 5. Frequency distribution of caries risk by age.

Age (Years)	Caries risk	Number (n)	Percentage (%)	Total number	Total percentage (%)
6	Low	0	0.0	7	100.0
	Moderate	1	14.0		
	High	6	86.0		
7	Low	0	0.0	5	100.0
	Moderate	0	0.0		
	High	5	100.0		
8	Low	0	0.0	4	100.0
	Moderate	0	0.0		
	High	4	100.0		
9	Low	0	0.0	5	100.0
	Moderate	1	20.0		
	High	4	80.0		
10	Low	0	0.0	2	100.0
	Moderate	0	0.0		
	High	2	100.0		
11	Low	1	25.0	4	100.0
	Moderate	0	0.0		
	High	3	75.0		
Total	Low	1	3.7	27	100.0
	Moderate	2	7.4		
	High	24	88.9		

The investigation into gender differences in caries risk within this study revealed a nuanced pattern. While the data indicated a slightly higher percentage of males (90.0%) categorized as having high caries risk compared to females (87.6%), this difference did not reach statistical significance. This observation prompts a deeper exploration of the complex interplay between gender and caries risk, considering biological, behavioral, and socio-cultural dimensions. The finding of a slightly elevated high caries risk in males, although not statistically significant, presents a contrast to a segment of existing literature that has historically reported a higher prevalence of caries in females. Traditional perspectives often attributed this disparity to hormonal fluctuations experienced by females, particularly during puberty and pregnancy, which could potentially influence salivary composition and flow, thereby affecting the oral environment's susceptibility to caries development. Furthermore, variations in dietary habits and food preferences between genders have also been explored as potential contributing factors. However, it is crucial to acknowledge that the landscape of research on gender differences in caries risk is not uniform. Conversely, this study's findings also align with a body of research that has demonstrated no significant gender differences in caries prevalence or risk. This suggests that while gender may play a role in influencing certain factors associated with caries development, the overall risk of caries may be more heavily influenced by other variables that transcend gender. These variables can include, but are not limited to, socioeconomic status, access to oral healthcare, dietary patterns, and oral hygiene practices. In this context, it is plausible that the impact of gender on caries risk is mediated or moderated by these more potent determinants. While the present study did not delve into specific biological mechanisms, it is important to acknowledge the potential role of biological factors in caries development. Differences in salivary flow rate and composition, enamel structure, and immune responses between genders could theoretically contribute to variations in caries susceptibility. Saliva plays a crucial role in buffering acids, clearing food debris, and providing antimicrobial protection. Variations in salivary gland function or the composition of salivary proteins could influence its protective capacity. Similarly, subtle differences in enamel thickness or composition could affect its resistance to acid demineralization. Further research that integrates biological assessments, such as salivary analysis and enamel microstructure evaluation, could provide a more comprehensive understanding of the biological underpinnings of gender differences in caries risk. Behavioral factors, encompassing dietary choices, oral hygiene practices, and healthcare-seeking behaviors, are pivotal in the etiology of dental caries. It is conceivable that gender-based variations in these behaviors could contribute to differences in caries risk. For instance, dietary patterns high in sugary snacks and beverages, or inadequate toothbrushing frequency and technique, can significantly elevate caries risk. Exploring gender-specific patterns in these behaviors within the study population could offer valuable insights. Do boys and girls exhibit different preferences for sugary foods? Are there variations in the frequency or effectiveness of toothbrushing between genders? Do cultural norms or parental influences shape oral hygiene practices differently for boys and girls? Addressing these questions through further investigation could illuminate the behavioral dimensions of gender differences in caries risk. The socio-cultural context within which individuals live plays a significant role in shaping health behaviors and outcomes. Gender roles, cultural norms, and societal expectations can influence dietary habits, oral hygiene practices, and attitudes towards oral health. In some cultures, there may be gender-specific expectations regarding food consumption or oral hygiene practices. For example, girls might be encouraged to consume more sweets or have different oral hygiene routines compared to boys.

These socio-cultural factors can indirectly or directly impact caries risk. Understanding the specific socio-cultural context of the study population in Padang, Indonesia, is crucial for interpreting the observed gender differences in caries risk. Investigating parental beliefs and practices regarding children's oral health, as well as cultural norms related to diet and hygiene, could provide valuable context for understanding gender-related patterns in caries risk. A notable characteristic of this study's sample was the unequal gender representation, with a higher proportion of females (59.3%) compared to males (40.7%). This disparity in sample size between genders introduces a potential source of bias that must be carefully considered when interpreting the results. While the study found a slightly higher percentage of males with high caries risk, the smaller sample size of males could limit the statistical power to detect a significant difference between genders. It is possible that with a larger and more balanced sample, a statistically significant gender difference might have emerged. Therefore, the unequal gender distribution underscores the importance of caution when drawing definitive conclusions about gender differences in caries risk based on this study's findings.[11-15]

The analysis of age-related trends in caries risk within this study revealed a complex and nuanced pattern. While certain age groups exhibited a 100% prevalence of high caries risk, suggesting an apparent increase in risk with age, the overall distribution across the age spectrum from 6 to 11 years presented a more intricate picture. This section delves into a more detailed examination of these age-related trends, considering developmental factors, variations in oral health behaviors, and the influence of environmental exposures. The study's findings highlighted that children in the 7, 8, and 10-year-old groups demonstrated a 100% prevalence of high caries risk. This observation might initially suggest a straightforward correlation between increasing age and elevated caries risk within this pediatric population. The transition from early childhood to middle childhood is marked by significant developmental changes, including the eruption of permanent teeth, which may present new surfaces susceptible to caries development. Additionally, dietary habits and oral hygiene practices may evolve as children gain more independence and autonomy in their daily routines. However, it is crucial to acknowledge that the 6 and 9-year-old groups also exhibited very high rates of high caries risk, with 86.0% and 80.0%, respectively. This indicates that the concern of high caries risk is not confined to specific age brackets but rather extends across the entire age spectrum under investigation. The 6-year-old group, in particular, represents a critical period in dental development, often characterized by the coexistence of primary and permanent teeth (mixed dentition). The susceptibility of newly erupted permanent teeth and the potential for caries progression in existing primary teeth contribute to the high caries risk observed in this age group. Variations in oral health behaviors and dietary habits across different age groups may contribute to the observed trends in caries risk. As children grow older, they may experience changes in their dietary preferences and patterns, potentially increasing their consumption of sugary snacks and beverages. Furthermore, the effectiveness of toothbrushing and other oral hygiene practices may vary depending on children's developmental stage and level of parental supervision. Younger children may rely more heavily on parental assistance with toothbrushing, while older children may assume greater responsibility for their oral hygiene, potentially leading to inconsistencies in technique and frequency. Exploring these behavioral factors in relation to age could provide valuable insights into the observed caries risk patterns. Environmental factors, such as access to fluoride and exposure to cariogenic bacteria, can also play a role in age-related trends in caries risk. Children's exposure to fluoride, whether through fluoridated water, toothpaste, or professional

applications, can vary depending on their age and access to dental care. Similarly, the acquisition and colonization of cariogenic bacteria in the oral cavity may occur at different ages, influencing the risk of caries development. Investigating these environmental exposures in conjunction with age could provide a more comprehensive understanding of caries risk dynamics. The study population exhibited an uneven distribution of participants across different age groups. The 6-year-old group had the highest number of participants (25.9%), while other age groups had varying levels of representation. This uneven distribution must be taken into account when interpreting the age-related trends in caries risk. Age groups with smaller sample sizes may not be as representative of the broader population, and the findings for these groups may be more susceptible to random variation. The 11-year-old group presented a slightly different pattern compared to the other age groups, with a lower percentage of participants classified as high risk (75.0%) and the presence of one participant with low caries risk. However, it is important to exercise caution when interpreting this finding due to the smaller sample size in this age category. The lower percentage of high caries risk in this group could be a genuine reflection of a trend towards decreasing caries risk in older children, or it could be an artifact of the limited sample size. Further research with a larger sample of 11-year-olds is needed to confirm this finding. The age range of 6 to 11 years encompasses significant developmental transitions in children's lives. This period includes the transition from early childhood to middle childhood, the eruption of mixed dentition and then mostly permanent dentition and increasing social and cognitive development. These developmental changes can influence children's susceptibility to caries and their ability to engage in effective oral self-care. Understanding how these developmental transitions intersect with caries risk is crucial for developing age-appropriate preventive interventions. The high prevalence of caries risk observed in the younger age groups, particularly the 6-year-olds, underscores the importance of early childhood caries (ECC) prevention. ECC is a significant public health problem that can have long-lasting consequences for children's oral and overall health. Preventive interventions should be initiated early in life, ideally before the eruption of the first primary tooth, to establish healthy oral hygiene habits and reduce the risk of caries development. Middle childhood, spanning the ages of 7 to 10 years in this study, represents a critical period for caries prevention and management. The 100% prevalence of high caries risk observed in the 7, 8, and 10-year-old groups highlights the need for targeted interventions during this developmental stage. These interventions should focus on reinforcing healthy oral hygiene habits, promoting dietary modifications, and providing fluoride exposure to protect newly erupted permanent teeth. While this study focused on children aged 6 to 11 years, it is important to consider the transition to adolescence and how caries risk may evolve during this period. Adolescence is characterized by further developmental changes, including hormonal fluctuations, increased independence, and evolving social influences. These factors can impact dietary choices, oral hygiene practices, and healthcare-seeking behaviors, potentially influencing caries risk trajectories. Future research should investigate caries risk trends across the transition from childhood to adolescence to inform the development of continuous and age-appropriate preventive strategies. The findings of this study underscore the need for age-appropriate preventive strategies tailored to the specific needs of children at different developmental stages. These strategies should consider the cognitive, social, and emotional development of children, as well as their evolving oral health needs. For younger children, interventions may focus on parental education and support to establish healthy oral hygiene habits and dietary patterns. For older children, interventions may emphasize self-

management skills, motivation, and peer influence to promote effective oral self-care. School-based programs can play a crucial role in delivering age-appropriate caries prevention interventions to children. Schools provide a structured environment where children can receive oral health education, fluoride applications, and other preventive services. School-based programs can also engage parents and families in promoting oral health and reinforcing healthy behaviors at home. Tailoring school-based programs to the specific needs of children at different age levels can enhance their effectiveness in reducing caries risk.[16-20]

4. Conclusion

In conclusion, this study revealed a very high prevalence of caries risk among pediatric patients visiting the Dental and Oral Hospital of Universitas Andalas (RSGM Unand). The overall prevalence of high caries risk was found to be 88.9%, with a slightly higher percentage observed in males (90.0%) compared to females (87.6%), although this difference was not statistically significant. Several age groups, specifically children aged 7, 8, and 10 years, demonstrated a 100% prevalence of high caries risk. These findings underscore the critical need for targeted and effective preventive and management strategies aimed at reducing the burden of dental caries in this population. The high prevalence of caries risk across all age groups highlights the importance of early intervention and the implementation of age-appropriate preventive measures. Further research with a larger sample size and a broader consideration of potential risk factors is warranted to gain a more comprehensive understanding of the factors contributing to the high caries burden in this region and to inform the development of more effective interventions. Such investigations could explore in greater depth the interplay of biological, behavioral, and socio-cultural factors influencing caries risk in this specific population.

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