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Severity Level of Primary Tooth Caries in Children with Mixed Dentition: A Descriptive Cross-Sectional Study at Ash Shiddiq Islamic Elementary School, Sidoarjo

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ABSTRACT

Objective: *This study aims to determine the severity of primary tooth caries in students of Ash Shiddiq Islamic Elementary School.* ***Methods:*** *This study is a descriptive cross-sectional study involving 68 students aged 6-11 years who are in the mixed dentition phase. Clinical examination was conducted using WHO criteria to measure the def-t index (decayed, exfoliated, filled Teeth).* ***Results:*** *Out of 68 students examined, it was found that all students (100%) had caries experience with a def-t score ranging from 1-18 (mean 4.78 ± 3.44). The decayed component (d) was dominant with an average of 3.88, followed by exfoliated (e) 0.87, and filled (f) 0.03. The severity level distribution shows that 42.65% of students have mild severity (n=29), 30.88% have moderate severity (n=21), and 26.47% have severe severity (n=18).* ***Novelty:*** *The severity of caries in children in the mixed dentition phase ranges from moderate to severe, with a predominance of teeth that have not received restorative treatment. These results emphasize the need for comprehensive preventive and educational intervention programs to control the development of caries during this critical phase.*

INTRODUCTION

Dental caries is the most prevalent chronic disease affecting children worldwide, including in Indonesia. These dental health issues begin early, even during the mixed dentition phase when primary and permanent teeth start to alternate. This phase is a critical period that determines a child's long-term dental health. Recent research indicates that caries in primary teeth can negatively impact the eruption and health of permanent teeth [1]. Furthermore, children with a history of high caries in primary teeth have a greater risk of developing caries in their permanent teeth [2].

The def-t index (decayed, exfoliated, filled teeth) is an international standard recommended by the WHO for measuring the occurrence of caries in primary teeth. The component d (decayed) indicates teeth with active caries, e (exfoliated) indicates teeth lost due to caries, and f (filled) indicates teeth that have received restorative treatment [3]. Understanding the distribution and severity of caries in the mixed dentition phase is crucial for developing effective prevention strategies [4]. Research indicates that the mixed dentition phase, which occurs around the ages of 6-11, is a critical transitional period when children begin to experience significant changes in their tooth composition. During this period, primary teeth begin to shed gradually and are replaced by permanent teeth, particularly the first permanent molars, which are at high risk of caries due to their deep grooves and incompletely matured enamel structure [4]. This condition requires special attention in terms of dental hygiene and caries prevention.

Epidemiological studies in various countries show that the prevalence of caries in children ranges from 50-90%, with significant variation depending on sociodemographic factors and oral health behaviors [5]. In Indonesia, the prevalence of caries in preschool and elementary school children is still considered high, but specific data on severity levels in the mixed dentition phase are still limited. This study was conducted to fill this knowledge gap by evaluating the severity of primary tooth caries in elementary school students who are in the mixed dentition phase.

RESEARCH METHOD

This research is a descriptive cross-sectional study involving 68 students from Ash Shiddiq Islamic Elementary School, aged 6-11 years and in the mixed dentition phase. All participants are in the mixed dentition phase, with a combination of primary and permanent teeth undergoing replacement. The study population was selected based on the consideration that at this stage, children have a sufficient incidence of caries for analysis, yet are still within a critical period for preventive interventions.

Inclusion criteria for this study included: students aged 6-11 years, in the mixed dentition phase, with at least three primary teeth, and willing to undergo clinical examination. Exclusion criteria included students with a history of genetic syndromes affecting tooth development, students undergoing extensive orthodontic treatment, and students who were absent on the day of examination.

Clinical examinations were performed by dentists using WHO standards. Each child was examined in a seated position with adequate lighting using a mouth mirror, probe, and excavator. Data was recorded using the def-t index (decayed, exfoliated, filled teeth) for primary teeth, with the following points: d (decayed): Primary teeth with active caries (cavitated or non-cavitated lesions) e (exfoliated): Primary teeth that have exfoliated due to caries f (filled): Primary teeth that have received restorative treatment for caries The severity of caries was classified based on the def-t score as follows:

Table 1. Criteria for the def-t/DMF-T Index.

Value	Information
0.0–1.1	Very low
1.2–2.6	Low
4.5–6.5	Moderate
> 6.6	High

This classification adapts the standards used in pediatric epidemiological research and has proven effective in categorizing the burden of caries disease in pediatric populations [6].

RESULTS AND DISCUSSION

Results

Here are the research findings: Table 2 presents a descriptive statistical summary for the overall def-t index and its components. The results show that the DEF-T values range from 1 to 18 with an average of 4.78 ± 3.44. The decayed (d) component dominates with an average value of 3.88, indicating that the majority of caries cases have not yet received treatment. The exfoliated (e) component has an average of 0.87, while the filled (f) component has a very low average (0.03), indicating limited access to restorative treatment [6].

Table 2. Descriptive Statistics for the DEF-T Index.

Variable	Mean	SD	Min	Max	Median
def-t	4.78	3.44	1	18	4.00
d (decayed)	3.88	2.99	0	14	3.00
e (exfoliated)	0.87	1.48	0	8	0.00
f (filled)	0.03	0.17	0	1	0.00

Based on severity classification, the distribution of participants is as follows:

Table 3. Distribution of Caries Severity.

Severity Category	Total (n)	Percentage (%)
Mild (def-t 1.2–2.6)	29	42.65
Moderate (def-t 4.5–6.5)	21	30.88
Severe (def-t > 6.6)	18	26.47
Total	68	100.00

The results show that 42.65% of students have mild severity, 30.88% have moderate severity, and 26.47% have severe severity. This indicates that over 57% of students experience moderate to severe caries, demonstrating a significant disease burden in this population.

Discussion

This study revealed that 100% of the students in the sample had a history of caries (def-t ≥ 1), indicating a very high prevalence of caries among children aged 6-11 years in the mixed dentition phase. These findings are consistent with global epidemiological data showing that early childhood caries remains a serious dental health problem in many regions [7]. The average def-t value of 4.78 indicates a moderate to high caries burden, with a dominance of the decayed component, suggesting an urgent need for treatment.

The mixed dentition phase is a very critical period in a child's dental development. At this stage, the child experiences the eruption of their first permanent teeth, particularly the first permanent molars, which anatomically have immature enamel structures and deep grooves, making them susceptible to caries [4]. Research shows that the first permanent molars have the highest risk of caries among all permanent teeth, with a caries prevalence that can reach 90% in some populations [8]. Additionally, this phase also marks the slow beginning of the loss of primary teeth, which can be reflected in the

exfoliated component of the def-t index. The dominance of the decayed component (81% of the total score) in this study indicates that most of the teeth affected by caries have not received treatment. This reflects low access to curative dental care and may also indicate a lack of parental awareness about the importance of primary tooth care. The almost non-existent filled component (only 2.94% of students) suggests that the dental healthcare system in this region may be more focused on extractions than restorations, or it may also indicate that parents prefer not to treat primary teeth because they are considered to fall out naturally [9].

Longitudinal studies have shown that children with a high history of caries in their primary teeth have a significantly increased risk of developing caries in their permanent teeth, a phenomenon known as "continuation of caries experience" [2]. Therefore, even tho primary teeth will gradually fall out, it is still important to care for these teeth not only to maintain masticatory and phonatory function, but also to prevent the spread of infection to growing and developing permanent teeth [10].

The severity of caries in children is influenced by various multifactorial factors. Epidemiological research has identified several key risk factors associated with increased caries severity in children during the mixed dentition phase. These factors include dietary habits (especially the consumption of sugary foods and drinks), oral hygiene practices (brushing teeth and using fluoride), and the family's socioeconomic status [5]. Brushing teeth and using fluoride toothpaste have been proven to be significant protective factors against caries [10]. Conversely, excessive consumption of sugary foods, especially school snacks, has been linked to an increased risk and severity of caries. Research conducted on a population of children shows that limiting snack time at school can reduce the incidence of caries, although the effects may not be immediately apparent [11].

Behavioral factors also play an important role. The practice of breastfeeding, formula feeding, or bottle-feeding has a significant impact on the risk of caries. Research shows that children who are exclusively breastfed have a lower risk of caries compared to children who are formula-fed. However, breastfeeding beyond the recommended duration (usually after the age of 2), especially if accompanied by the consumption of other fermentable carbohydrates, can increase the risk of caries [10].

Recent studies show that the severity of caries in children has a significant impact on their quality of life. Untreated cavities can cause pain, difficulty eating, sleep disturbances, and other general health problems [2]. Furthermore, children with severe caries often experience negative psychosocial impacts, including decreased self-esteem and reduced social engagement [12]. This impact is not only felt by the child but also by their family, as parents often have to take time off work to take their child to the dentist [13].

The results of this study have important implications for caries prevention and management strategies in children during the mixed dentition phase. First, there is a need for the implementation of comprehensive prevention programs in schools, including oral health education, topical fluoride application, and pit and fissure sealants, particularly on newly erupted permanent first molars. Second, there is a need to improve access to

curative dental health services, including restorative treatment for functional primary teeth.

Research indicates that fluoride varnish and oral health education have varying effectiveness depending on their implementation. While fluoride varnish alone may not be sufficient to prevent caries in permanent first molars, a strong combination with oral health education shows better results [14]. Additionally, strategies with more specific targets for behavior and dietary changes may be more effective than biomedical interventions alone [15].

CONCLUSION

Fundamental Finding : This study revealed a significant severity of caries in children in the mixed dentition phase, with a prevalence of 100% and a severity distribution showing 42.65% mild severity, 30.88% moderate severity, and 26.47% severe severity. The dominance of the decayed component in the def-t index indicates the need for improved access to curative dental healthcare services. The mixed dentition phase is a critical period that requires special attention in terms of caries prevention and management to prevent the disease from progressing to permanent teeth. **Implication :** The results of this study emphasize the importance of implementing comprehensive prevention programs in schools, including oral health education, fluoride application, and pit and fissure sealants. Additionally, there is a need to increase public and parental awareness about the importance of primary tooth care, as well as to improve access to affordable and easily accessible dental health services for all segments of society. **Limitation :** Despite the high levels of perceived value, usability, and user acceptance, the system demonstrated notable limitations related to automation effectiveness, financial tracking features, and integration with existing farm management software. These technical and functional constraints may have affected the overall operational performance and limited the system's ability to fully support comprehensive farm management needs. In addition, the reliance on user perception data may restrict the generalizability of the findings, as actual long-term system performance and objective productivity outcomes were not extensively measured. **Future Research :** Longitudinal studies are needed to identify specific risk factors influencing the severity of caries in the mixed dentition phase and to evaluate the effectiveness of different preventive interventions.

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