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Overview of brain health and dental caries in early childhood in Pekon Wonodadi, Gadingrejo Subdistrict, Pringsewu Regency

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Abstract

Background: Dental caries is the destruction of tooth tissue that begins at the surface and can progress to the pulp (Nurhidayanti, 2020). According to the 2018 Basic Health Research (Riskesdas), the most common dental problem in Indonesia is decayed/damaged/aching teeth (45.3%), with an average DMF-T index of 1.9 for permanent teeth. Caries experience frequently occurs among elementary school children, particularly when dental care habits are poor. Brain health plays a vital role in children's learning abilities, especially in fifth grade, when brain development accelerates and affects cognitive functions such as concentration. A study by Kusmana and Restuningsih (2020) showed a relationship between the DMF-T index and students' academic performance.This study aims to describe brain health and def-t (decayed, extracted, and filled teeth in primary teeth) among early childhood children in Pekon Wonodadi, Pringsewu.
Method: The method used was a descriptive survey with a research population of 128, involving all early childhood children. The sample was taken using a non-probability sampling technique based on the Isaac and Michael formula, resulting in a total of 96 respondents. The research instruments were a questionnaire and a def-t examination form. Data were analyzed using descriptive statistical tests.
Results: The study found that the majority of parents were adults (83%), and 65% of them were housewives. Good brain health was observed in 74.7% of the children, while a high prevalence of dental caries (def-t) was found in 80.6% of them.
Conclusion: This study can help identify early childhood children who are at high risk of brain health issues and dental caries, supporting early intervention efforts.

Keywords: Brain health; caries; decay; early childhood

INTRODUCTION

Oral and dental health is an integral part of overall body health. According to the World Health Organization (WHO) in 2018, oral health is considered a key indicator of general well-being and quality of life. Oral health encompasses the health of the entire oral cavity, including the teeth and supporting structures, and is characterized by the absence of pain and diseases such as oral and throat cancers, oral infections and sores, periodontal (gum) disease, tooth decay (caries), tooth loss, as well as other disorders and conditions that may impair an individual's ability to bite, chew, smile, and speak.

Dental caries is a disease of the tooth tissue that begins at the tooth surface and can progress to the pulp, as described by (1). According to the 2018 Basic Health Research (Riskesdas), the most prevalent dental issue in Indonesia is damaged/decayed/aching teeth (45.3%), with an average DMF-T index of 1.9 for permanent teeth. The National Action Plan of 2020 set a target of achieving a dental caries index of 1.26 (2). Caries experience is common among elementary school children, especially if they do not practice good oral hygiene habits such as regular toothbrushing and other healthy oral practices. Lifestyle and dietary habits can also influence the risk of developing caries.

Poor oral health can place an additional burden on the overall health system, including the brain, through inflammatory processes and immune responses. This inflammation can cause pain, eating disorders, and even affect sleep quality—all of which may negatively impact brain health. Brain health is closely related to learning ability and academic achievement. Children with optimal brain health tend to perform better academically. At the fifth-grade level, children experience rapid and complex brain development. Cognitive functions such as concentration, comprehension, and creativity continue to evolve. Optimal brain health at this stage supports the achievement of their intellectual potential.

This is in line with the findings of Kusmana and Restuningsih (2020), who reported a relationship between the DMF-T index and the academic performance of fifth-grade students at SDN Kiarajangkung II, Sukahening Subdistrict, Tasikmalaya Regency. In accordance with the Health Transformation agenda, one of its pillars being the Transformation of Health Human Resources, Poltekkes Kemenkes Tanjungkarang has strengthened its Tri Dharma of Higher Education through research under the Poltekkes Kemenkes Tanjungkarang Center of Excellence in Health Education (SUP-PK), specifically focusing on brain health (3).

METHOD

This study employed a descriptive survey method. The aim was to describe brain health and the def-t index among early childhood children in Pekon Wonodadi, Gadingrejo District, Pringsewu Regency, in 2024. The research population consisted of 128 early childhood children in Pekon Wonodadi, Gadingrejo District, Pringsewu Regency, in 2024. The sample was selected using a non-probability sampling technique, specifically systematic sampling. The sample size was determined using the Isaac and Michael formula, resulting in 96 respondents. The research instruments included a brain health questionnaire administered to the children's parents and a def-t examination form. The def-t index was calculated using the formula: def-t = d + e + f, where *d* = decayed teeth that could still be restored, *e* = teeth indicated for extraction/missing due to caries, and *f* = filled teeth. The mean def-t index was obtained by dividing the total def-t score by the number of children examined. Data were analyzed using descriptive statistical tests (4). Research Procedure:

1. Submission of a request letter for research approval to the Director of Poltekkes Tanjung Karang.
2. Calibration among the research team and students involved in the study.
3. Confirmation of the research schedule with the village head and dissemination of information regarding the research activities.
4. Preparation of research instruments and materials.
5. Implementation Stage**:** The research team, assisted by three students, conducted interviews and def-t examinations.
6. Interviews were carried out using the brain health questionnaire with the mothers, and the children's def-t examination results were recorded on the examination form.
7. Souvenirs were provided to the respondents.
8. Gratitude was expressed to the parents and respondents, followed by a formal farewell to the village authorities.

RESULTS

Frequency distribution of the age of parents of early childhood children in Pekon Wonodadi, Kecamatan

Table 1. Frequency Distribution of Parents' Age of Early Childhood in Pekon Wonodadi, Gadingrejo District, Pringsewu Regency, 2024

Age Category	Number	%
Adult	83	86
Middle Adult	13	14
Total	96	100

It is known that the age categories of parents of early childhood children in Pekon

Wonodadi, Gadingrejo Subdistrict, Pringsewu Regency in 2024 consist of 86% adults and 14% middle-aged adults.

Occupational Distribution of Parents of Early Childhood Children in Pekon Wonodadi, Gadingrejo Subdistrict, Pringsewu Regency

Table 2. Frequency Distribution of Parents' Occupations of Early Childhood in Pekon Wonodadi, Gadingrejo District, Pringsewu Regency, 2024

Occupation Category	Number	%
Laborer	6	6
Teacher	10	10
Housewife	65	68
Entrepreneur	3	3
Self-employed	12	13
Total	**96**	**100**

It is known that 68% of the parents of early childhood children in Pekon Wonodadi, Gadingrejo Subdistrict, Pringsewu Regency in 2024 are housewives.

Frequency Distribution of Parental Education Levels of Early Childhood Children in Pekon Wonodadi, Gadingrejo Subdistrict, Pringsewu Regency

Table 3. Frequency Distribution of Parents' Education of Early Childhood in Pekon Wonodadi, Gadingrejo District, Pringsewu Regency, 2024

Education Category	Number	%
Elementary School	1	1,1
Junior High School	17	17,7
Senior High School	45	46,9
Diploma III (D3)	10	10,4
Diploma IV/Bachelor (D4/S1)	19	19,8
Master's (S2)	4	4,1
Total	**96**	**100**

It is known that the majority of parents of early childhood children in Pekon Wonodadi, Gadingrejo Subdistrict, Pringsewu Regency in 2024 have a senior high school education, accounting for 46.9%.

Overview of Brain Health in Early Childhood Children in Pekon Wonodadi, Gadingrejo Subdistrict, Pringsewu Regency

Table 4. Frequency Distribution of Brain Health Disorder Risks in Early Childhood in Pekon Wonodadi, Gadingrejo District, Pringsewu Regency, 2024

Category	Number					
	Yes		No		Maybe	
	n	%	n	%	n	%
Sleep disorder	36	37,5	58	60,4	2	2,1
Repetitive behavior disorder	35	36,5	58	60,4	3	3,1
Sudden behavior changes	20	20,8	74	77,1	2	2,1
Difficulty concentrating	23	24	66	68,8	7	7,2
Speech and language disorder	14	14,6	80	83,3	2	2,1
Mild or severe head injury	3	3,1	91	94,8	2	2,1
Sudden changes in motor skills	21	21,9	75	78,1	0	0

Based on the results of the study conducted in Pekon Wonodadi, it was found that 60.4% of children did not exhibit any sleep disturbances, while 37.5% showed signs of sleep disturbances, and 2.1% were possibly experiencing sleep disturbances.

Based on the results of the study conducted in Pekon Wonodadi, 60.4% of children did not show any signs of repeated behavioral disorders, while 36.5% of children exhibited behavioral issues, and 3.1% were possibly experiencing such disorders. These findings indicate that although the majority of children in Pekon Wonodadi do not have significant behavioral problems, the 36.5% prevalence is substantial and warrants attention.

Repeated behavioral disorders, as found in these 36.5% of children, are consistent with other studies showing that behavioral problems in early childhood are relatively common.

Additionally, based on the research conducted in Pekon Wonodadi, 77.1% of children did not exhibit sudden drastic changes in behavior, while 20.8% did show such behavioral changes, and 2.1% were possibly experiencing them. These findings suggest that most children in this area have relatively stable behavioral development, although the 20.8% of children exhibiting repeated behavioral disturbances should be a focus of concern**.**

Based on the results of the study conducted in Pekon Wonodadi, 68.8% of children did not experience difficulties with concentration, while 24% showed signs of confusion or difficulty concentrating, and 7.3% were possibly experiencing such issues. The 24% prevalence is relatively high and deserves attention, as concentration difficulties in early childhood can significantly affect future academic and social development.

Based on the results of the study conducted in Pekon Wonodadi, it was found that 83.3% of children did not exhibit speech or language disorders, while 14.6% showed signs of such disorders, and 2.1% were possibly experiencing them.

In this study, 94.8% of children had never experienced a head injury, while 4.2% had experienced either mild or severe head injuries, and 1% were possibly affected.

A total of 78.1% of children in Pekon Wonodadi did not show any sudden changes in motor skills, while 21.9% exhibited such changes.

Overview of Dental Caries Experience in Children in Pekon Wonodadi, Gadingrejo Subdistrict, Pringsewu Regency

Table 5. Frequency Distribution of Dental Caries in Early Childhood in Pekon Wonodadi, Gadingrejo District, Pringsewu Regency, 2024

Dental Caries Criteria	Number	%
Caries	91	95
Caries-free	5	5
Total	**96**	**100**

Dental caries is one of the most common health problems among children worldwide. Based on examinations of 95 children in Pekon Wonodadi, it was found that 95% of children had dental caries, while only 5% were caries-free. This high prevalence of early childhood caries reflects a variety of factors that influence oral health in children, including dietary habits, tooth brushing behavior, access to dental care, and parental awareness of the importance of dental hygiene.

DISCUSSION

Overview of Brain Health in Early Childhood Children

These findings are consistent with various studies indicating that sleep disturbances in early childhood are relatively common, with prevalence rates ranging between 25% and 50%. The 37.5% of children experiencing sleep disturbances in this study may be affected by a range of factors, including parenting styles, sleep environment conditions, and the child's physical or mental health. Environmental factors such as noise, light, and inconsistent bedtime routines can contribute to poor sleep quality. In addition, psychological factors such as anxiety or stress experienced by the child can also lead to sleep disturbances.

Conversely, sleep disturbances in children can negatively impact brain development, cognitive function, and behavior. Children who frequently experience sleep problems are at risk of having issues with attention, hyperactivity, and emotional regulation. Moreover, sleep

disturbances in childhood may be associated with behavioral problems and lower academic achievement later in life. (5)(6)(7).

A study by Willoughby et al. (2011) revealed that approximately 20% to 40% of preschool-aged children exhibit behaviors indicating self-regulation problems, which may manifest as aggression, impulsivity, or hyperactivity.

Factors contributing to repeated behavioral disorders in children may include various aspects such as home environment, parenting styles, and socioeconomic conditions. Research shows that children raised in unstable environments or those exposed to domestic violence are at a higher risk of developing behavioral problems. Furthermore, children who receive insufficient attention or are excessively exposed to electronic media tend to experience emotional and behavioral regulation difficulties(8).

Various interventions have proven effective in reducing behavioral disorders in children. Cognitive-behavioral interventions that focus on emotional and behavioral regulation training, along with educational programs designed to support social-emotional development, can help lower the prevalence of repeated behavioral disorders. Parent training is also crucial in promoting responsive and positive parenting, which supports behavioral regulation in children.

In early childhood, optimal brain development is strongly influenced by environment, parenting, and appropriate stimulation. The brains of young children experience rapid development in areas related to self-control, emotional regulation, and behavior. Brain regions such as the frontal lobes and prefrontal cortex are responsible for executive functions, including impulse control, attention regulation, and decision-making. Disruptions in the development of these areas may lead to repeated behavioral problems such as hyperactivity, impulsivity, and aggressiveness(9).

Behavioral disorders in early childhood are also often associated with psychological conditions such as Attention Deficit Hyperactivity Disorder (ADHD), where children have difficulty controlling impulsive behavior, are easily distracted, and tend to be hyperactive. ADHD is often linked to dysfunctions in brain networks that regulate attention and behavioral control. In cases where children exhibit aggressive behavior, there are often underlying issues in emotional and social development, which can stem from various factors including family environment, mental health conditions, or early exposure to stress(10).

A study conducted by Thomas et al. (2004), which found that approximately 15% to 25% of preschool-aged children exhibit significant behavioral problems, including sudden drastic changes in behavior. Contributing factors to these behavioral issues may include stress, inconsistent parenting, and a lack of emotional support at home. Additionally, psychological conditions such as anxiety or depression in children may also cause sudden behavioral changes(11).

Approaches to addressing recurrent behavioral disorders and drastic behavioral changes in children involve behavioral interventions and parental education. Providing strong emotional support and establishing consistent routines at home can help reduce negative behaviors. Furthermore, early interventions, such as cognitive behavioral therapy for children showing early signs of behavioral disorders, can be highly effective in managing these issues before they progress further.

Sudden behavioral changes in children may indicate underlying problems such as brain developmental disorders, psychological conditions like anxiety disorders, or exposure

to traumatic events. Unexpected behavioral changes in early childhood may include sudden aggression, extreme mood swings, loss of interest in previously enjoyed activities, or decline in social skills. Brain areas such as the prefrontal cortex, which plays a role in controlling emotions and behavior, undergo rapid development during childhood. Disruptions in the development of this region can lead to dysfunctions in emotional and behavioral regulation(12).

Studies have shown that children exposed to chronic stress or trauma often exhibit drastic behavioral changes. In addition, environmental factors such as changes within the family (e.g., divorce, death), bullying, or major disruptions in daily routines may also affect a child's emotional and behavioral stability(13).

Other studies have shown that concentration problems in early childhood are fairly common. Research by Polderman et al. (2007) found that approximately 20% to 25% of preschool-aged children experience difficulties maintaining attention and focus. This is consistent with the findings from this study, which showed that around 24% of children in Pekon Wonodadi experienced similar problems(14). Furthermore, research by Willcutt et al. (2012) indicated that children who frequently experience confusion or concentration difficulties are at a greater risk of encountering academic performance issues and social functioning problems later in life(15).

Several factors can contribute to concentration difficulties in children, including genetic predisposition, sleep patterns, nutritional quality, and social environment. A lack of positive stimulation and excessive exposure to electronic media may also impair a child's ability to concentrate. In addition, psychological conditions such as anxiety or stress experienced in the home environment can worsen these difficulties(16).

To address concentration problems in early childhood, interventions involving parents and caregivers are essential. Approaches such as behavior management strategies, limiting screen time, and creating consistent daily routines can help children improve their focus. Ensuring adequate sleep and providing proper nutrition are also crucial for supporting cognitive development and concentration skills. Stimulating programs designed to train children's executive functions, such as games that require problem-solving, focus, and decision-making, can be beneficial in enhancing concentration abilities. Support from family, teachers, and caregivers plays a vital role in fostering an environment conducive to healthy brain development(17).

Speech and language disorders in early childhood can be caused by several factors, including delayed neurological development, hearing problems, or medical conditions such as Autism Spectrum Disorder (ASD).

According to the American Speech-Language-Hearing Association (ASHA), speech and language disorders can hinder a child's ability to understand and express information effectively, which may impact their social and academic skills later in life(18). A study by Law et al. (2000) also found that approximately 5–10% of young children experience language problems, which may be attributed to genetic and environmental factors, such as a lack of verbal stimulation at home(19).

Head injuries, whether mild or severe, can impact a child's brain development depending on the location and severity of the injury. Head trauma may lead to cognitive, behavioral, and physical impairments, such as difficulties with concentration, personality changes, or motor dysfunction.

Research by McKinlay et al. (2008) indicated that even mild head injuries in children can result in long-term problems with executive

function, memory, and attention. The importance of early management of head injuries is recognized by several organizations, including the American Academy of Pediatrics (AAP), which recommends that children who have sustained a head injury be closely monitored for any signs of cognitive or physical decline(20).

Motor skills involve coordination between the brain and muscles, and sudden changes in these abilities may indicate neurological disorders. Brain injuries, nervous system disorders, or medical conditions such as cerebral palsy can lead to a decline in motor abilities in children.

Sudden changes in motor skills are often associated with disruptions in brain development. According to research by Adolph & Hoch (2019), children's motor skills develop through daily experiences and physical practice. Children who experience delays or regressions in motor development should be evaluated to determine whether there are developmental risk factors affecting their motor abilities(21).

Diet and Sugar Consumption

One of the main causes of caries in children is the frequent consumption of sugary foods and beverages, especially when consumed between meals. According to Sheiham and James (2014), excessive sugar intake is closely associated with an increased risk of dental caries, particularly when not balanced with proper oral hygiene practices. Sugar left on the surface of the teeth interacts with plaque bacteria to produce acids that erode the tooth enamel(22).

Tooth Brushing Habits

Irregular or ineffective tooth brushing is also a major factor in the development of caries. A study by Seow (2012) showed that children who do not brush their teeth twice daily with fluoride toothpaste are at higher risk of developing caries. Many parents are unaware of the importance of starting oral care as soon as the first tooth erupts, increasing the likelihood of early caries(23).

Access to Dental Care

Socioeconomic factors and access to dental care play a crucial role in the high prevalence of caries among children. In rural areas or locations with limited healthcare access, such as Pekon Wonodadi, the lack of dental facilities and oral health education often hampers preventive care. According to a report by the World Health Organization (WHO, 2017), children living in areas with limited access to dental services are more likely to suffer from untreated dental caries(24).

Parental Role

The level of knowledge and awareness of parents regarding the importance of children's oral health significantly affects dental conditions. Research by Colak et al. (2013) found that parents who are not educated about child dental care—such as the importance of tooth brushing, using fluoride toothpaste, and making regular dental visits—are more likely to have children who suffer from caries(25).

CONCLUSIONS

In 2024, the age category of parents of early childhood children in Pekon Wonodadi, Gadingrejo Subdistrict, Pringsewu Regency is dominated by adults (83%), followed by middle-aged adults (13%). The occupational background shows that 65% of parents are housewives. The overall brain health condition of early childhood children in the area is considered good in 74.7% of the cases. Meanwhile, the dental caries experience (def-t) among children in Pekon Wonodadi reaches 80.6%, indicating a high prevalence of dental decay in early childhood.

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