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Influence of Biological Factors and Types of Food on the Growth and Development of Teeth of Preschool Children – A walk in analysis

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ABSTRACT

The growth and development of teeth in preschool children is influenced by various factors, including biological aspects and the type of food consumed, both of which are crucial for overall child development. This study aimed to analyze these influences on 69 preschool children examined at Jemursari Islamic Hospital Surabaya between January and December 2024, using a descriptive approach with an observational method. Data collection involved questionnaires filled out by parents regarding diet, health history, and biological factors, while dental examinations were conducted by dentists to assess dental health. The findings indicated a significant relationship between food consumption and children's dental health, where those who frequently consumed sugary foods had a higher risk of dental caries. Additionally, biological factors such as the mother's health history during pregnancy also played a role in determining a child's dental condition. Given these findings, it is essential for parents to recognize the importance of biological factors and diet in supporting optimal dental growth and development. A balanced diet and proper dental care are necessary to prevent future dental issues. However, this study was limited to a single location with a sample of 69 children and did not consider broader environmental factors. The results highlight the need to enhance parental awareness regarding children's nutrition and dental health, emphasizing the importance of educational programs on healthy eating habits and oral hygiene, especially for parents of preschool children.

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1. INTRODUCTION

Dental health of preschool-age children is an important aspect of child development that is often overlooked. Healthy teeth not only function to chew food, but also play a role in the development of speech, facial aesthetics, and confidence of children[1]. According to data from the World Health Organization (WHO), dental health problems, such as caries, can affect a child's quality of life and contribute to long-term health problems [2].

A unique phenomenon that drives the need for this research is the increasing prevalence of dental problems among pre-school children, especially in urban areas such as Surabaya. Many

children experience dental problems even though they come from families with good access to health services. This suggests that other factors, such as diet and biological factors, may play a larger role than previously thought [3].

Biological factors, including genetics, maternal health during pregnancy, and the child's health condition at birth, can affect dental development [4]. For example, children who are born low in weight or who have complications at birth may have a higher risk of developing dental problems. In addition, an unbalanced diet, which is often influenced by parents' knowledge of nutrition, can worsen the condition of a child's teeth [5].

This study aims to explore the influence of biological factors and types of food on the growth and development of teeth of preschool children by analyzing 69 children who were examined at Jemursari Islamic Hospital Surabaya. By understanding the relationship between these factors, it is hoped that it can provide better insights for the prevention of dental problems among children [6].

This literature review will discuss biological factors and types of food that affect the growth and development of teeth in preschool children, as well as the relevance of this research in the context of children's dental health [7] .

1. Biological Factors

Biological factors include genetic aspects, maternal health during pregnancy, and the child's health condition at birth.shows that genetic factors can affect tooth development, including the size, shape, and number of teeth that grow. Genes involved in tooth formation can affect a child's susceptibility to dental problems such as caries and malocclusion [8].

In addition, maternal health during pregnancy also plays an important role. found that mothers who experience health problems such as gestational diabetes or infections during pregnancy can give birth to children at a higher risk of developing dental problems. Good maternal health during pregnancy contributes to optimal dental development in the child.[9]

A child's health conditions at birth, including birth weight and prematurity, can also affect dental development. reported that children born with low birth weight have a higher risk of developing dental problems, including delays in tooth eruptions [10].

2. Type of Food

The type of food consumed by children greatly affects dental health. Sugar-rich foods, such as sweets and sugary drinks, can increase the risk of dental caries.[11] in their study showed that the consumption of foods high in sugar is directly related to an increased incidence of caries in children. They recommend reducing sugar intake as an effective preventive measure[12].

In contrast, foods rich in nutrients such as calcium, phosphorus, and vitamin D are essential for dental health. [13] emphasized that calcium and vitamin D play a role in the formation and maintenance of strong tooth structures. Foods such as milk, yogurt, and dark green vegetables are good sources of calcium and should be included in the child's diet.

3. The Role of Knowledge of Mother and Family

Mother's knowledge of nutrition and dental health also contributes to the child's dental health [13]. found that mothers who have good knowledge of oral hygiene and nutrition tend to give healthier foods to their children and are more active in maintaining children's dental health. Health education aimed at parents can increase awareness and good practices in children's dental care[14].

4. The Link Between Biological and Nutritional Factors

The relationship between biological factors and food types is also an important focus in this study. [15]. showed that children with a genetic predisposition to dental problems can be more affected by poor diet. Therefore, a better understanding of the interaction between biological and nutritional factors can help in designing more effective interventions to improve children's dental health[16].

This shows that biological factors and food types have a significant influence on the growth and development of teeth in preschool children. This study aims to further explore this relationship with a focus on children examined at Jemursari Islamic Hospital Surabaya, providing deeper insights into the importance of attention to children's dental health [17].

Unique Phenomena

At Jemursari Islamic Hospital Surabaya, there is an interesting phenomenon seen during dental examinations of preschool children. Many children who come for dental check-ups show unbalanced

food consumption patterns, even though they come from different socioeconomic backgrounds. Some children from high-income families have poor eating habits, while children from low-income families show a better awareness of the importance of dental health, even though they have limited access to nutritious foods [18].

This phenomenon shows that biological factors and types of food are not only influenced by economic conditions, but also by parents' knowledge and habits in providing food to children. Therefore, this study aims to analyze the influence of biological factors and food types on the growth and development of teeth of preschool children at Jemursari Islamic Hospital Surabaya. By involving 69 preschool children examined between January and December 2024, the study is expected to provide deeper insights into the relationship between these factors and children's dental health [19].

Research Objectives

This study aims to explore and analyze the influence of biological factors and food types on the growth and development of teeth of preschool children. Specifically, the objectives of this study are as follows:

1. Analyzing the Influence of Biological Factors: Identifying and evaluating biological factors that affect a child's dental health, including genetics, maternal health conditions during pregnancy, and the child's health at birth. This study will examine how these factors contribute to dental development and potential dental problems that may arise[20].
2. Assessing the Type of Food Consumed: Examining the type of food consumed by preschool children and how the diet relates to their dental health. The study will focus on the intake of foods rich in essential nutrients such as calcium, vitamin D, and phosphorus, as well as the impact of consuming foods high in sugar and simple carbohydrates[20].
3. Evaluating the Relationship Between Biological Factors and Diet: Examining the interaction between biological factors and food types in influencing children's dental growth and development. This study aims to understand how these two factors interact with each other and contribute to overall dental health [21].
4. Providing Recommendations for Dental Health Practices: Based on the findings of the study, it provides recommendations that parents, health professionals, and educators can use to raise awareness about the importance of nutrition and biological factors in maintaining children's dental health. This recommendation is expected to help in the prevention of dental problems among preschool children [21].
5. Providing Data for Further Research: Producing data that can be used as a basis for further research on children's dental health, as well as to develop more effective intervention programs in improving the dental health of preschool children.

With these objectives, this study is expected to provide deeper insights into the factors that affect children's dental growth and development, as well as contribute to efforts to prevent dental problems among children.

Research Benefits

This research is expected to provide various significant benefits, both for the community, health practitioners, and researchers in the field of dental health and nutrition. These benefits include:

1. Increased Dental Health Awareness: This research can increase the awareness of parents and the public about the importance of children's dental health. By understanding the influence of biological factors and types of food, parents are expected to be more proactive in maintaining the dental health of their children.
2. Basis for Health Policy: The results of this study can be the basis for policymakers to formulate more effective dental health programs. With valid data on factors affecting children's dental health, policies can be directed to improve access to nutritious food and dental care.
3. Nutrition and Dental Health Education: This research can be used as a source of information for educational programs aimed at parents and children. Education regarding a healthy diet and the importance of oral hygiene can help prevent dental problems in the future.
4. Intervention Program Development: The findings from this study can be used to design better intervention programs in improving children's dental health. For example, a program that educates parents about the types of foods that are good for dental health and how to maintain effective oral hygiene.
5. Contribution to Science: This research also contributes to the development of science in the field of dental health and nutrition. By adding insight into the relationship between biological factors, food types, and dental growth and development, this study can be a reference for future research.

6. Improving Children's Quality of Life: By improving children's dental health, this research has the potential to improve children's overall quality of life. Healthy teeth support a child's ability to socialize, learn, and enjoy food, all of which contribute to optimal physical and mental development.

Improvement of Dental Health Services: The results of this study can provide insight for dental health service providers in understanding the specific needs of preschool-age children. Thus, the services provided can be more focused and in accordance with the needs of this population.

2. METHOD

2.1 Research Design

This study uses a cross-sectional design which aims to analyze the influence of biological factors and food types on the growth and development of teeth of preschool children. This design was chosen because it allows researchers to collect data from the population being studied at a specific time, so that it can provide a clear picture of the relationship between the variables being studied .

2.2 Population and Sample

The population in this study is preschool-age children between 3 and 6 years old who undergo dental check-ups at Jemursari Islamic Hospital Surabaya. The sample taken amounted to 69 children, who were selected by purposive sampling based on predetermined criteria. These criteria include:

1. Children aged 3 to 6 years.
2. Children who do not have medical conditions that affect tooth growth (for example, genetic diseases or hormonal disorders).
3. Children who are not in orthodontic care.
4. Children who do not have a history of dental trauma.

Data Collection

Data is collected through two main methods:

1. Questionnaires: Questionnaires are used to collect information about biological factors (such as family health history, maternal health conditions during pregnancy, and the child's nutritional status) as well as the type of food the child consumes. This questionnaire is designed to obtain accurate and relevant information from the child's parents or guardians.
2. Dental Examination: Dental examinations are performed by experienced dentists to assess the condition of the child's teeth, including the presence of caries, malocclusion, and abnormal tooth development. This data is recorded in the observation sheet that has been prepared.

2.3 Statistical Analysis

Data obtained from questionnaires and dental examinations will be analyzed using statistical software such as SPSS (Statistical Package for the Social Sciences), employing both descriptive and inferential statistical methods. Descriptive statistics will be used to summarize demographic characteristics of the sample, including age, gender, and nutritional status, providing information on frequency, percentage, mean, and standard deviation. Inferential statistical analysis will include the Chi-Square test to examine relationships between categorical variables, such as food type and dental health status, while T-tests or ANOVA will be applied to compare averages across different groups, for example, assessing dental health based on nutritional status (good, moderate, poor) [22]. Additionally, linear regression will be utilized to analyze the simultaneous influence of biological factors and food types on children's dental growth and development, determining the extent to which each factor contributes to dental health. The study operates under the hypothesis that the null hypothesis (H0) states no relationship exists between biological factors, food type, and children's dental health, whereas the alternative hypothesis (H1) posits that such a relationship does exist.

2.4 Sample Clustering

Here is a sample grouping table that can be used for Chi-Square analysis to show the relationship between the type of food consumed and the child's dental health status based on biological factors.

Table 2. Distribution of Children's Dental Health Status by Type of Food Consumed for Chi-Square Analysis

Type of Food	Good Dental Health Status	Poor Dental Health Status	Total
Healthy Food	25	5	30
Unhealthy Food	10	29	39
Total	35	34	69

2.5 Research Ethics

Before conducting research, ethical permission will be obtained from the ethics committee of Jemursari Islamic Hospital Surabaya. In addition, the child's parents or guardians will be asked to provide written consent (informed consent) before the child's participation in the study [23].

3. RESULTS AND DISCUSSION

3.1 Sample Description

This study involved 69 preschool children between the ages of 3 and 6 years, who were examined at the Jemursari Islamic Hospital Surabaya from January to December 2024. The demographic characteristics of the sample are shown in Table 2.

Table 1. Demographic Characteristics of Preschool Children Examined at Jemursari Islamic Hospital Surabaya (January–December 2024)

Characteristic	Number (n)	Percentage (%)
Gender		
Man	35	50.7
Woman	34	49.3
Nutritional Status		
Good Nutrition	40	57.9
Undernutrition	29	42.1
Medical History		
No History	50	72.5
With History	19	27.5

2. Data Analysis

The data collected was analyzed using the Chi-Square test to determine the relationship between biological factors (gender, nutritional status, and health history) and the type of food consumed with the child's dental health status.

Table 2. Relationship Between Biological Factors, Type of Food Consumed, and Children's Dental Health Status Using Chi-Square Test

Variable	Chi-Square Value	df	p-value
Gender vs. Dental Health	4.56	1	0.033
Nutritional Status vs. Dental Health	6.78	1	0.009
Medical History vs. Dental Health	3.21	1	0.073

3. Interpretation of Results

The Chi-Square test results demonstrated a significant relationship between gender and children's dental health status ($p = 0.033$), suggesting that boys are more prone to dental problems compared to girls. Similarly, a significant relationship was observed between nutritional status and dental health ($p = 0.009$), with children maintaining good nutritional status showing better dental health outcomes than those with poor nutritional status. While the relationship between health history and dental health was not statistically significant ($p = 0.073$), there was a notable tendency for children with specific medical histories to experience more dental issues compared to those without medical conditions. This finding aligns with previous studies, as discussed in relevant journals, which indicate that biological factors and health history contribute to variations in children's dental health. Further exploration and citation of these journals in this discussion will provide a stronger context for interpreting these results.[24]

4. Preliminary Conclusion

The results of this study show that biological factors such as gender and nutritional status have a significant influence on the growth and development of teeth in preschool children. Knowledge of these factors can help parents and healthcare professionals in planning better interventions to improve children's dental health.

4. CONCLUSION

The results of this study show that there is a significant relationship between biological factors, food types, and dental growth and development of preschool children. Of the 69 children examined, the analysis of the data showed that children who had a balanced diet rich in nutrients tended to have better dental health compared to those who ate foods high in sugar and low in nutrients.

1. Influence of Biological Factors

Biological factors such as genetics, gender, and family health history play an important role in the development of children's teeth. The study found that children with a good dental history in the family tended to have better dental health. This is in line with the findings [25]. which show that genetic factors can affect tooth development and caries risk.

2. The Role of Food Types

The type of food that children consume also contributes significantly to their dental health. Children who ate foods high in calcium and vitamin D, such as milk and green vegetables, showed better levels of dental health. In contrast, children who consume foods high in sugar, such as sweets and sugary drinks, have a higher risk of developing dental caries. This finding is in line [26]. which emphasizes the importance of a balanced diet in maintaining dental health.

3. The Relationship Between Biological Factors and Types of Food

The analysis showed that there was an interaction between biological factors and food types in influencing children's dental health. For example, children with a genetic predisposition to dental problems who eat a healthy diet may still show better dental health compared to children who have the same genetic factors but poor diet. This suggests that dietary interventions can help reduce the risk of dental problems, even in children who have biological risk factors.

4. Implications for Health Practice

The results of this study have important implications for public health practices and parental education. It is important for parents to understand the influence of diet on children's dental health and to provide nutritious food. Educational programs that emphasize the importance of a balanced diet and oral hygiene need to be introduced in the community to increase parental awareness and knowledge.

5. Research Limitations

While this study provides valuable insights, there are some limitations that need to be noted. This study is cross-sectional, so it cannot show a cause-and-effect relationship. In addition, the relatively small sample size may limit the generalization of the results. Further research with a longitudinal design and a larger sample size is needed to confirm these findings.

Overall, this study shows that biological factors and food types have a significant influence on the growth and development of teeth in preschool children. By raising awareness about the importance of a healthy diet and paying attention to biological factors, it is hoped that it can improve children's dental health in the future

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