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The Relationship Between Knowledge of Dental Health Maintenance and Debris Index

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ABSTRACT Health is essential for overall well-being and productivity, and oral health is closely linked to general health. Issues in the mouth can affect the whole body and human quality of life. At Sanggar Alang-Alang, for the preliminary observation 10 children showed an average OHIS score of 3.2 and a Debris Index of 2.1—both in the poor category. This study aimed to examine the relationship between dental health knowledge and the Debris Index among 48 street children using a cross-sectional correlation design. Data were collected through questionnaires and oral examinations, then analyzed with the Spearman Rank test. Results showed no relationship between dental health knowledge and the Debris Index. Although most adolescents had good knowledge, their debris levels remained high. This indicates that knowledge alone is not enough to ensure good oral hygiene; proper attitudes and behaviors must also support it.

INDEX TERMS Knowledge, debris index, street children, dental health, cross-sectional study, spearman rank.

I. INTRODUCTION

Health plays a vital role in every aspect of human life, contributing to physical, mental, and social well-being. It is not only defined by the absence of disease, but also by the ability of individuals to function effectively in their everyday routines. Good health enables people to work productively, interact socially, and take part in economic and community activities, ultimately supporting a better quality of life[1]. Oral health is strongly connected to overall health and the two cannot be viewed separately. Conditions or problems in the oral cavity can influence the health of the entire body and may even affect a person's daily functioning. Poor oral health can reduce overall well-being and, on a broader scale, impact the quality and productivity of human resources [2].

Street children are young individuals who spend the majority of their time in public spaces—working, playing, or engaging in daily activities—often because economic hardship prevents their families from meeting their basic needs. Living and growing up in these environments greatly affects their overall well-being. Their attention to oral hygiene becomes minimal due to limited supervision, lack of resources, and little awareness of proper dental care. In addition, street children generally have poor access to health services or insurance, making it difficult for them to receive regular check-ups or treatment when problems occur. These conditions place them at higher risk for oral diseases and other health complications[3].

According to the Indonesian Health Survey (SKI), 45.69% of the population has oral health problems, but only 43.0% have received treatment. Among children aged 10–14, about 63.8% experience dental issues, especially dental caries[4]. Oral health can be assessed in two ways: objectively through examinations performed by dental professionals, and subjectively through individuals' own reports of their oral condition. Both approaches are widely recognized in oral health evaluation. A key factor in maintaining good oral health is oral health literacy, which refers to a person's ability to access, process, and understand essential oral health information and services. This level of understanding helps individuals make informed and appropriate decisions regarding their dental and oral care[5].

Dental caries is a pathological condition that damages tooth structures. It usually begins on the surface of the tooth—such as in pits, fissures, or between teeth—and can progress inward toward the pulp. Caries can affect anyone and may develop in various areas of the teeth, gradually spreading from the enamel to the dentin and even the pulp. Several factors contribute to the development of dental caries, including carbohydrate intake, the presence of microorganisms, saliva conditions, and the surface characteristics or anatomy of the teeth[6].

Teeth are solid structures made of several layers and are divided into the crown, neck, and root. The root brings nutrients into the tooth. The outermost layer, enamel,

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protects the tooth and is the hardest tissue in the body, though it can be damaged by acids. It is thickest on the biting surfaces and becomes thinner near the gums. Under the enamel lies dentin, the main hard tissue of the tooth. Dentin is weaker than enamel and more easily affected by saliva, food, and bacteria. In the root and neck, dentin is covered by cementum, which helps secure the tooth to the jawbone. At the center of the tooth is the pulp, a soft tissue containing nerves and blood vessels. The pulp provides nourishment and sensation and helps keep infections from spreading beyond the tooth[7].

The development of dental caries is shaped by several factors, such as the condition of the teeth and daily eating or drinking habits. Nighttime toothbrushing is especially important for preschool children. When they do not brush their teeth before sleeping, their OHIS scores can rise, increasing the likelihood of caries. This is because saliva flow drops significantly at night, causing the mouth to become dry and reducing its natural ability to neutralize plaque. Combined with food debris left on the teeth, this environment speeds up demineralization and promotes the formation of dental caries[8].

Debris is the term used for food remnants that stay on the tooth surface after eating. If not removed, these particles can build up and contribute to plaque. The mouth has natural ways to help clear debris: saliva helps rinse away small particles and neutralize acids, while the movement of the tongue and other oral muscles during chewing helps loosen and remove remaining debris. Although these natural processes support oral cleanliness, they cannot replace proper brushing and flossing[9]. During the preliminary data collection at Sanggar Alang-Alang Wonokromo Surabaya, researchers observed that the 10 children assessed had an average OHIS score of 3.2 and a Debris Index average of 2.1, both categorized as poor. These results indicate that the primary issue is the elevated Debris Index score of 2.1 among the street children residing at the Sanggar Alang-Alang shelter.

II. METHOD

The research employed a cross-sectional correlation design, meaning data were collected from participants at a single, predetermined moment. The study site was Sanggar Alang-Alang in Wonokromo, Surabaya, a social organization that provides support for street children and families in need. The institution offers a range of educational and social programs aimed at fostering the development and improving the well-being of the children it serves. Cross-sectional research, where exposure and outcomes are evaluated simultaneously, is generally regarded as offering limited value for drawing causal inferences[10]. In epidemiology and public health, cross-sectional studies are used to measure both exposure (as a possible cause) and disease (as the effect) at the same time. They allow researchers to compare disease rates and symptoms between groups that are exposed and those that are not[11].

A. STUDY DESIGN AND RATIONALE

Cross-sectional studies are epidemiological designs that can serve descriptive or analytical purposes depending on the aim of the research. They are relatively fast and cost-efficient, making them suitable for estimating the prevalence of a condition. However, because exposure and outcome are recorded at the same moment, the temporal sequence between them cannot be determined. These studies can be grouped into descriptive or analytical types. Analytical cross-sectional studies include a specific hypothesis and investigate whether there is an association between different qualitative or quantitative variables[11].

B. STUDY SETTING

This study was conducted at Sanggar Alang-Alang, located at Jl. Gunungsari No. 25, Sawunggaling, Wonokromo, Surabaya, East Java. Sanggar Alang-Alang is a community-based institution that supports street children and low-income families through various developmental programs. The center provides educational and social activities aimed at improving the children's quality of life, including basic education, skills training, character development, and basic health services such as dental health education. The research took place over two months, from June to July 2025, covering data collection, processing, and analysis, as well as preparation for presenting the study results.

C. PARTICIPANTS AND SAMPLING METHOD

This study involved 48 children from Sanggar Alang-Alang, which also represented the full population of the institution. The sample consisted of all children who met the inclusion criteria—namely, being between 8 and 17 years old, cooperative, and having submitted informed consent. Because every child fit these requirements, the study used a total sampling approach. Data collection was carried out by giving questionnaires to the children at Sanggar Alang-Alang. Before distributing them, the researcher and an enumerator coordinated to ensure a shared understanding of the procedures. They then obtained permission from the institution and informed the children about the purpose of the study. The informed consent forms were handed out together with the questionnaires, and the children were guided on how to fill them out properly.

Sampling refers to selecting a portion of a larger population—whether individuals or objects—for the purpose of meeting specific research goals. While sampling offers several advantages and some limitations, it is used to obtain data that are manageable yet still representative. A

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sample is essentially a smaller group taken from a much larger one to be measured or analyzed in a study.

For instance, it would be difficult to test every chip produced in a factory, so a few chips are chosen at random to check their taste, shape, and size. This example shows why sampling is vital when the population is large. In research, sampling methods are generally grouped into two types: probability and non-probability sampling[12].

D. DATA COLLECTION INSTRUMENTS AND PROCEDURE

The researcher began by visiting the Alang Alang Wonokromo Surabaya studio to request permission from the studio manager to conduct the study. After obtaining approval, the necessary equipment and materials were prepared, along with the research questionnaire. One enumerator was recruited, and a brief alignment session was held to ensure a shared understanding of the research procedures. Upon arrival at the Alang Alang workshop, the researcher introduced himself to the children and explained the purpose and objectives of the study. Questionnaires were then distributed to children aged 8–17 years, who were asked to complete them independently. Afterward, the researcher collected the completed questionnaires and proceeded to conduct the Debris Index examination with assistance from the enumerator. Data were collected through the distribution of questionnaires, which were completed by the children at the Alang Alang studio. The instruments used during data collection included a Debris Index examination sheet, a box of hand gloves, 70% alcohol (350 ml), 35 sets of disposable tweezers and mouth mirrors, and GC Tri Plaque ID Gel.

E. DATA ANALYSIS

The data obtained from the questionnaire and dental examination were processed using Windows-based SPSS (*Statistical Product and Service Solutions*) software. This study employed Spearman's rank correlation test to analyze the relationship between dental health maintenance and the debris index among children. Normality testing indicated that the data on dental health maintenance knowledge and the debris index of street children aged 8–17 years at Sanggar Alang Alang Wonokromo were not normally distributed. As a result, Spearman's rank correlation was used to assess the association between the two variables. Spearman's correlation, being non-parametric, is appropriate for analyzing ordinal data and does not require the assumption of normally distributed variables. Statistical significance was assessed using a two-tailed test with an alpha level of 0.05 ($p < 0.05$)[13].

F. ETHICAL CONSIDERATIONS

The research protocol received approval from the Institutional Review Board of Poltekkes Kemenkes Surabaya (Approval No. E/3739/KEPK-Poltekkes_Sby/V/2025). Before collecting any data, the researchers requested formal permission from the head of the Sanggar Alang Alang Wonokromo Surabaya Foundation and secured consent from both teachers and parents. Every participant's parent was required to sign an informed consent form after being clearly informed about the study's objectives, benefits, procedures, and any possible risks involved. All personal information from respondents was kept confidential and used strictly for academic purposes. Furthermore, dental assessments were performed following proper hygiene standards, using sterilized tools and appropriate personal protective equipment to ensure the children's comfort and safety throughout the examination process.

III. RESULTS

TABLE 1
Distribution of Age Frequencies Among Children at Sanggar Alang Alang

Age	Frekuensi	Persentasse (%)
8 y.o	2	5,71%
9 y.o	3	8,57%
10 y.o	6	17,14%
11 y.o	5	14,28%
12 y.o	5	14,28%
13 y.o	1	2,85%
14 y.o	2	5,71%
15 y.o	1	2,85%
16 y.o	5	14,28%
17 y.o	5	14,28%
Total	35	100%

According to the information in TABLE 1, it indicates that children aged 8 years make up 5.71% of the sample, while those aged 9 years account for 8.57%. The proportion increases among 10-year-olds at 17.14%, followed by 11- and 12-year-olds, each representing 14.28%. Meanwhile, children aged 13, 14, and 15 years each comprise 2.85% of the group. Additionally, 16- and 17-year-olds each make up 14.28%, and those aged 18 years contribute 2.85% to the total population.

TABLE 2
Distribution of Gender Frequeincies Among Street Children at the Workshop

Gender	Frequencies	Percentage (%)
Female	23	65,71%
Male	12	34,29%
Total	35	100%

According to the information presented in TABLE 2, The data indicates that 65.71% of the street children at the Alang

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Alang Wonokromo Center are female, while 34.29% are male.

TABLE 3
Distribution of Dental Health Care Knowledge Levels Among Street Children at Sanggar Alang Alang Wonokromo

Level of Knowledge	Frequencies	Percentage (%)
Good	16	45,7%
Moderate	10	28,6%
Poor	9	25,7%
Total	35	100%

According to the information presented in TABLE 3 shows that 45.7% of street children's knowledge of dental health maintenance is good, 28.6% is adequate, and 25.7% is poor.

TABLE 4
Distribution of Debris Index Scores Among Street Children at Sanggar Alang Alang Wonokromo

Criteria	Frequencies	Percentage (%)
Good	16	0%
Moderate	10	51,4%
Poor	9	48,6%
Total	35	100%

According to the findings presented in TABLE 4, that 51.4% of debris index street children sanggar alang alang wonokromo moderate criteria and 48.6% debris index with poor criteria.

TABLE 5
Analysis of the Relationship Between Dental Health Knowledge and Debris Index in Street Children Aged 8–17 Years at Sanggar Alang Alang Wonokromo

Variabel	Category			*P value*
	Good	Moderate	Poor	
Debris Index	0	18	17	0.917
Knowledge	16	10	9	

Based on the results of the Spearman's rank test in TABLE 5, the significance value obtained was 0.917, which is greater than $\alpha = 0.05$. This indicates that H0 is accepted and H1 is rejected, meaning there is no significant relationship between dental health maintenance knowledge and the debris index among street children aged 8–17 years at Sanggar Alang Alang Wonokromo.

IV. DISCUSSION

A study by [14] revealed that street children in Sukajadi District exhibited diverse DMF-T index scores, ranging from minimal dental caries to completely cavity-free conditions. This pattern suggests inadequate understanding and practices related to oral hygiene, compounded by their tendency to brush their teeth only once daily[15].

This study is consistent with the findings [16], which showed that although respondents demonstrated fairly good knowledge, their actual behaviors were still not optimal. This gap exists because the respondents still lacked a deeper understanding of proper dental and oral hygiene practices, even after receiving guidance on how to maintain oral health[17].

The findings of this study correspond with the research conducted by [18], which highlights that even when individuals possess sufficient knowledge about oral health, this understanding does not always manifest in the condition of their oral cavity. Numerous predisposing factors can influence whether knowledge turns into action, including personal habits, lifestyle patterns, and environmental circumstances[19]. For instance, respondents may fully recognize that skipping toothbrushing can negatively affect their oral health, yet this awareness often does not motivate consistent practice. Many still neglect to brush regularly due to factors such as limited discipline, lack of encouragement, or daily routines that do not prioritize oral hygiene[20]. As a result, despite having the necessary information, their oral health remains suboptimal because the knowledge is not effectively translated into behavioral change[21].

The Debris Index represents a score that indicates the presence of hard deposits resulting from the crystallization of inorganic materials—mainly calcium carbonate and calcium phosphate—combined with food particles, bacteria, and exfoliated epithelial cells[22]. When oral hygiene is not maintained properly, debris and calculus accumulate on the tooth surface. This buildup can initiate gingivitis, which, if not addressed, may advance to periodontal disease[23]. Typical signs of this progression include gum swelling, bleeding, pus formation, persistent bad breath, and increasing tooth mobility that can even lead to teeth falling out without external force[24].

Dental debris is the accumulation of food remnants or discoloration that clings to the tooth surface, between the teeth, or along the gums after eating[25]. If these deposits are not cleaned thoroughly, they can trigger various oral health issues, such as plaque buildup, calculus formation, tooth decay, and gum disorders[26]. The cognitive domain, especially knowledge, serves as a fundamental driver of behavioral change that eventually leads to new habits. Awareness of proper oral hygiene is highly important, particularly for adolescents, as it plays a significant role in determining their overall dental health[27]. Still, possessing knowledge alone is insufficient unless it is supported by appropriate attitudes and real actions.

An unfavorable OHI-S score is identified by the presence of plaque and calculus that remain on the surfaces of the teeth. Dental plaque is a soft, tightly adhering layer made up of microorganisms that proliferate within an intercellular matrix, typically caused by poor oral hygiene habits. When plaque persists on the teeth and along the gumline, it poses a substantial risk of harming both the hard tooth structures and

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the supporting tissues, potentially resulting in problems such as tooth decay.

The study results reveal that the street children at Sanggar Alang-Alang, Wonokromo, display varying levels of dental health knowledge. Some children fall into the good category, others into the adequate category, and the remainder demonstrate poor understanding. This shows that although a portion of the children are fairly knowledgeable about dental health, many still do not have sufficient comprehension.

Regarding their oral hygiene, as assessed through the Debris Index, some children were found to have moderate hygiene levels, while the rest were categorized as poor. None of the participants reached the good category, indicating that even children with higher knowledge levels did not consistently apply this knowledge in their daily oral hygiene practices.

This disparity shows that the relationship between knowledge and behavior is not always straightforward. Even when individuals possess adequate knowledge, it does not automatically translate into good practices[28]. Factors such as access to hygiene resources, early habit formation, consistent supervision, and the influence of the social environment play crucial roles in determining whether knowledge is effectively applied in daily life[29].

Consequently, these findings underline the need for strategies that go beyond education alone. It is essential to build a supportive environment that encourages behavioral change, such as providing dental care supplies, establishing regular toothbrushing routines, and engaging educators or health volunteers in interactive workshop activities.

The elevated Debris Index observed in the children can be traced to their limited knowledge and lack of awareness about the importance of oral hygiene. Furthermore, inadequate access to hygiene facilities and basic dental care items, such as toothbrushes and toothpaste, also contributes to this problem. Their irregular lifestyle as street children, combined with minimal adult oversight, further diminishes their ability to maintain proper self-care, including oral hygiene. The purpose of this study was to explore the connection between dental health knowledge and the Debris Index. The findings revealed a correlation: children with better knowledge generally showed lower Debris Index scores (indicating cleaner teeth), even though overall knowledge levels remained low. This supports the notion that knowledge is a key component in shaping clean and healthy behavioral patterns.

In summary, the low Debris Index scores among the children at Sanggar Alang-Alang indicate a clear need for more focused and continuous educational initiatives. Dental health education programs that are specifically designed to match the needs and conditions of street children are urgently required so they can better understand the importance of oral hygiene and apply it effectively in daily life.

Additionally, knowledge by itself is not a reliable measure of adolescents' dental and oral hygiene. Without being accompanied by consistent hygiene practices, good knowledge does not automatically lead to good oral health outcomes[30].

Apart from knowledge, behavioral and action factors also play an important role in supporting adolescents' efforts to maintain oral hygiene[31]. Behavior can be understood as an individual's response to certain stimuli that generate perceptions and feelings[32]. Understanding the factors that influence health-related behavior involves examining aspects such as attitudes, subjective norms, and perceived behavioral control, as these variables significantly affect a person's health decisions[33]

Health promotion is essential to support oral hygiene among adolescents, and it should be accompanied by practical instructions so they clearly understand what steps to take to care for their teeth[34]. This approach aims not only to improve their knowledge but also to influence their behavior and daily practices. Health promotion ultimately seeks to encourage positive behavioral changes, expand understanding, and create an environment that supports healthy habits[35].

V. CONCLUSION

Based on the analyzed data and overall assessment, it was found that the street children at Sanggar Alang-Alang Wonokromo generally possess a good level of knowledge regarding dental health care. However, their Debris Index results show that while many fall into the moderate category, a notable number still fall within the poor category. The Spearman's Rank statistical test produced a significance value of 0.917, which is higher than $\alpha = 0.05$, indicating that H0 is accepted and H1 is rejected. This means that no significant relationship exists between dental health care knowledge and the Debris Index among street children aged 8–17 years at Sanggar Alang-Alang Wonokromo. In light of this study's results, Sanggar Alang-Alang Wonokromo is encouraged to enhance its educational activities related to adolescent dental health, such as offering routine counseling sessions or organizing small group discussions to improve their understanding. The adolescents are also expected to benefit from these findings, particularly in recognizing the importance of maintaining good oral hygiene. The center can support this by creating engaging programs—like a regular "Tooth Brushing Day" or dental cleanliness competitions—to help instill healthy habits in an enjoyable manner. Additionally, the managers of the youth center are advised to give greater attention to the hygiene practices of the adolescents by providing constructive encouragement, such as offering shared toothbrushing facilities or rewarding positive habits. Consistent oral health promotion is equally necessary and should include hands-on activities, such as

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demonstrations of proper toothbrushing techniques. These initiatives can also involve local health center professionals to ensure the information delivered is accurate, practical, and easy for the adolescents to implement.

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DATA AVAILABILITY

No datasets were generated or analyzed during the current study.

AUTHOR CONTRIBUTION

Regina Amelia Muslim was responsible for conceptualizing and designing the study, gathering the data, and engaging in the analysis and interpretation process. Sri Hidayati managed the intervention procedures and contributed to writing and refining the manuscript. Sunomo Hadi aided in analyzing and interpreting the data, provided important input on the manuscript, and took part in the literature review, data collection, and editing. All authors examined and approved the final manuscript and agreed to be accountable for maintaining the accuracy and integrity of the work.

DECLARATIONS

ETHICAL APPROVAL

This research received approval from the Institutional Review Board (IRB) of Poltekkes Kemenkes Surabaya, Indonesia (Approval No. E/3739/KEPK-Poltekkes_Sby/V/2025) and was carried out in alignment with ethical guidelines for studies involving human participants. Informed consent was obtained from all parents or guardians after they were given a clear explanation of the study's purpose and procedures. To protect confidentiality, participants were assigned numerical codes, and no identifying information was included in any report. All collected data were stored securely—digital files were protected with passwords, while printed documents were placed in locked storage accessible only to the researcher. These steps ensured the safeguarding of data and the privacy of participants throughout the study.

CONSENT FOR PUBLICATION PARTICIPANTS.

Consent for publication was given by all participants

COMPETING INTERESTS

The authors declare no competing interests.

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