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The Relationship Between Parents' Knowledge of Oral and Dental Health Maintenance and the Oral Hygiene Status of Visually Impaired Students at SMPLB-A and SMALB-A YPAB Surabaya

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ABSTRACT Children with visual impairments are particularly vulnerable to poor oral hygiene due to limitations in visual perception and motor coordination, which hinder their ability to perform effective self-care. As a result, parental involvement plays a critical role in maintaining their oral and dental health. However, limited parental knowledge regarding appropriate oral health practices may contribute to inadequate hygiene outcomes in this population. This study aimed to examine the relationship between parents' knowledge of oral and dental health maintenance and the oral hygiene status of visually impaired students at SMPLB-A and SMALB-A YPAB Surabaya. A descriptive correlational study with a cross-sectional design was conducted involving 24 visually impaired students and their parents, selected through total sampling. Parental knowledge was assessed using a structured and validated questionnaire covering tooth-brushing techniques, appropriate brushing times, and dental care practices. The oral hygiene status of the students was evaluated clinically using the Simplified Oral Hygiene Index (OHI-S). Data were analyzed using the Spearman rank correlation test to determine the association between parental knowledge and children's oral hygiene status. The results revealed that the majority of parents had a moderate level of oral health knowledge (58.3%), while only 33.3% demonstrated high knowledge. None of the students achieved a "good" oral hygiene status; 33.3% were categorized as "fair," and 66.7% as "poor." The mean OHI-S score was 3.49, exceeding the national target value of ≤1.2. Statistical analysis showed a strong and significant correlation between parental knowledge and oral hygiene status ($\rho = 0.848$; $p < 0.05$). In conclusion, higher parental knowledge of oral and dental health maintenance is strongly associated with better oral hygiene outcomes among visually impaired children. These findings highlight the need for targeted oral health education programs for parents to improve preventive care and oral health status in this vulnerable group.

INDEX TERMS Parental Knowledge, Oral Hygiene Status, Visual Impairment, OHI-S, Dental Health Education.

I. INTRODUCTION

Oral and dental health is a fundamental component of general health and significantly influences physical well-being, social interaction, and overall quality of life. Inadequate oral hygiene during childhood has been associated with long-term consequences, including dental caries, periodontal disease, pain, impaired nutrition, and reduced psychosocial functioning [1], [2]. These risks are substantially higher among children with visual impairments, who experience limitations in visual perception and motor coordination that hinder effective self-care and independent oral hygiene practices [3], [4]. The inability to visually assess plaque accumulation and brushing effectiveness places visually impaired children at a heightened risk of poor oral hygiene and oral disease [5].

Recent studies consistently report that visually impaired children exhibit poorer oral hygiene status compared to their sighted peers, characterized by higher plaque scores, gingival inflammation, and untreated dental caries [6]–[8]. In developing countries, including Indonesia, these conditions are further exacerbated by limited access to disability-friendly dental services and preventive oral health programs [9], [10]. Evidence from national and international studies indicates that the average Simplified Oral Hygiene Index (OHI-S) scores among visually impaired children frequently exceed recommended clinical thresholds, reflecting a persistent public health concern [11], [12]. These findings highlight the need for preventive strategies that extend beyond clinical treatment and incorporate behavioral and educational components.

Parents serve as the primary caregivers and play a central role in shaping children's oral hygiene behaviors, particularly for visually impaired children who rely heavily on verbal instruction, tactile guidance, and direct supervision [13], [14]. Parental knowledge regarding tooth-brushing techniques, brushing frequency, dietary control, and routine dental visits has been identified as a key determinant of children's oral

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health outcomes [15]. State-of-the-art research in pediatric oral health emphasizes caregiver-centered approaches, demonstrating that parental involvement and education can significantly improve oral hygiene status among children with special needs [16], [17]. Educational interventions that actively involve parents have been shown to reduce plaque accumulation and improve oral hygiene behaviors in visually impaired populations [18].

Despite these advances, a clear research gap remains. Most existing studies focus either on describing oral hygiene status among visually impaired children or evaluating the effectiveness of oral health education interventions, without explicitly examining the quantitative relationship between parental knowledge and children's oral hygiene status using standardized clinical indices such as the OHI-S [19]–[21]. Furthermore, evidence from Indonesian special education settings remains limited, and contextual factors such as parental education level, health literacy, and caregiving roles are often underreported [22], [23]. This gap underscores the need for empirical research that positions parental knowledge as a key determinant of oral hygiene outcomes in visually impaired children.

Therefore, this study aims to investigate the relationship between parents' knowledge of oral and dental health maintenance and the oral hygiene status of visually impaired students at SMPLB-A and SMALB-A YPAB Surabaya. By employing a cross-sectional correlational design and utilizing the Simplified Oral Hygiene Index, this research seeks to generate evidence-based insights relevant to preventive oral health strategies.

The contributions of this study are threefold. First, it provides empirical evidence on the association between parental oral health knowledge and clinically measured oral hygiene status among visually impaired children. Second, it offers context-specific data from a special education setting in Indonesia, addressing a notable gap in regional literature. Third, the findings may inform the development of targeted parental education programs and policies aimed at improving oral health outcomes among children with visual impairments [24], [25]. This article is structured as follows: Section II describes the research methodology; Section III presents the results; Section IV discusses the findings in relation to existing literature; and Section V concludes the paper with recommendations for practice and future research.

II. METHODS

A. STUDY DESIGN AND SETTING

This study employed an analytical observational design with a cross-sectional approach. The cross-sectional design was selected to examine the relationship between parental knowledge of oral and dental health maintenance and the oral hygiene status of visually impaired children at a single point in time. This design is widely used in oral health research to identify associations between behavioral factors and clinical outcomes without manipulating variables [26]. The study was conducted at SMPLB-A and SMALB-A YPAB Surabaya, Indonesia, institutions providing secondary-level education for students with visual impairments. Data collection was carried out between January and March 2025.

B. STUDY POPULATION AND SAMPLE

The study population consisted of all visually impaired students enrolled at SMPLB-A and SMALB-A YPAB Surabaya and their respective parents or primary caregivers. Inclusion criteria for students were: (1) diagnosed visual impairment (total or partial blindness), (2) enrollment at SMPLB-A or SMALB-A YPAB Surabaya during the study period, and (3) willingness to participate with parental consent. Students with systemic conditions affecting oral health or those undergoing orthodontic treatment were excluded. Parents or caregivers were eligible if they were the primary individual responsible for the child's daily care and oral hygiene supervision.

A total sampling technique was applied, whereby the entire accessible population meeting the inclusion criteria was recruited. This resulted in 24 parent–child pairs being included in the study. Total sampling was chosen due to the limited population size and to minimize selection bias, ensuring complete representation of the target group [27]. No randomization was applied, as this was an observational, non-experimental study.

C. ETHICAL CONSIDERATIONS

Ethical approval was obtained from the institutional ethics committee of Poltekkes Kemenkes Surabaya prior to data collection. Written informed consent was obtained from all parents or guardians, and assent was obtained from the students. Confidentiality and anonymity were maintained throughout the study by coding all participant data and restricting access to the research team only. The study adhered to ethical principles outlined in the Declaration of Helsinki [28].

D. RESEARCH VARIABLES

Two primary variables were investigated. The independent variable was parental knowledge of oral and dental health maintenance. The dependent variable was the oral hygiene status of visually impaired students. Potential confounding factors such as age, gender, and parental education level were recorded descriptively but were not included in multivariate analysis due to the limited sample size.

E. INSTRUMENTS AND MATERIALS

Parental knowledge was assessed using a structured questionnaire developed specifically for this study. The questionnaire consisted of 20 dichotomous (Guttman scale) items divided into three domains: tooth-brushing techniques (6 items), appropriate brushing time and frequency (7 items), and dental care practices, including dental visits and dietary habits (7 items). The questionnaire was developed based on recent oral health education literature and expert consultation to ensure content relevance [29].

Prior to the main study, the questionnaire underwent validity and reliability testing using a pilot sample of 10 parents of visually impaired students from SLB-A YPAB Surabaya who were not included in the final analysis. Content validity was evaluated through expert judgment, while reliability was assessed using internal consistency testing. The

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results indicated that the instrument was both valid and reliable for use in the study population.

Oral hygiene status of the students was assessed through direct clinical examination using the Simplified Oral Hygiene Index (OHI-S), which comprises the Debris Index (DI-S) and Calculus Index (CI-S). Examinations were conducted using sterile mouth mirrors and explorers under adequate lighting conditions. The OHI-S was selected due to its widespread use, simplicity, and suitability for epidemiological studies involving children with special needs [30].

F. DATA COLLECTION PROCEDURES

Data collection was conducted in a single session for each participant. Parents completed the knowledge questionnaire under the supervision of the researcher to ensure comprehension. For students, oral examinations were performed by a calibrated dental health professional. Examiner calibration was conducted prior to data collection to minimize inter-observer variability. All examinations followed standardized OHI-S scoring procedures.

G. DATA ANALYSIS

Collected data were coded and entered into a statistical software package for analysis. Descriptive statistics were used to summarize participant characteristics, parental knowledge levels, and oral hygiene status. Knowledge scores were categorized into low, moderate, and high levels based on predetermined cut-off points. Oral hygiene status was classified as good, fair, or poor according to OHI-S criteria.

The relationship between parental knowledge and oral hygiene status was analyzed using the Spearman rank correlation test. This non-parametric test was selected due to the ordinal nature of the data and the small sample size. Statistical significance was set at $\alpha = 0.05$. The results were presented as correlation coefficients (ρ) and corresponding p-values.

III. RESULTS

A. Characteristics of Parent Respondents of Visually Impaired Students at SMPLB-A and SMALB-A YPAB Surabaya

TABLE 1
Frequency Distribution of Parent Respondent Characteristics of SMPLB-A and SMALB-A YPAB Surabaya

Respondent Characteristics	Frequency	Percentage
Parental Age Distribution		
34-42	6	25,0%
43-48	10	41,0%
50-55	6	25,0%
56-59	2	8,0%
Parental Gender Distribution		
Male	5	20,0%
Female	19	79,0%
Parental Education Distribution		
Elementary School or Equivalent	2	8,0%
Senior High School	14	58,0%
Higher Education	8	33,0%

Based on the data in TABLE 1, 41% of parent respondents were aged 43–48 years. The majority were female (79%) and most had attained a senior high school education (58%). These demographic characteristics may influence their level of knowledge and awareness regarding oral and dental health, potentially affecting the hygiene practices of their children.

B. Characteristics of Visually Impaired Students at SMPLB-A and SMALB-A YPAB Surabaya

TABLE 2
Frequency Distribution of Visually Impaired Student Characteristics at SMPLB-A and SMALB-A YPAB Surabaya

Respondent Characteristics	Frequency	Percentage
Age Distribution of Visually Impaired Students		
12-14	9	37,0%
15-17	11	45,0%
19-20	4	16,0%
Gender Distribution of Visually Impaired Students		
Male	10	41,0%
Female	14	58,05

TABLE 2 shows that most visually impaired students at SMPLB-A and SMALB-A YPAB Surabaya were in the 15–17 year age group, comprising 45% of the total participants, followed by those aged 12–14 years (37%) and 19–20 years (16%). The gender distribution indicates a higher proportion of female students (58.3%) compared to male students (41.7%). This distribution suggests that the study population was predominantly composed of mid-adolescent students, with a slightly higher representation of females among visually impaired learners at the study sites.

C. Results of Parental Knowledge Levels on Dental Health Maintenance of Students at SMPLB-A and SMALB-A YPAB Surabaya in 2025

TABLE 3
Distribution of Parents' Knowledge Related to the Maintenance of Oral and Dental Health

Knowledge Level	Frequency	Percentage
High	8	33,3%
Moderate	14	58,3%
Low	2	8,3%
Total	24	100%

TABLE 3 illustrates the distribution of parental knowledge regarding oral and dental health maintenance. The majority of parents demonstrated a moderate level of knowledge (58.3%), while 33.3% were categorized as having a high level of knowledge. A smaller proportion of parents (8.3%) exhibited low knowledge. These findings indicate that although a considerable number of parents possessed adequate understanding of oral health maintenance, gaps in knowledge remained among a subset of caregivers, which may influence the oral hygiene practices of their visually impaired children.

D. Frequency Distribution of Dental Hygiene (OHI-S) among Students of SMPLB-A and SMALB-A YPAB Surabaya in 2024

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TABLE 4 shows that the dental hygiene status of students at SMPLB-A and SMALB-A YPAB Surabaya was 0% in the good category, 33.3% in the fair category, and 66.7% in the poor category.

TABLE 4
Frequency Distribution of Dental Hygiene (OHI-S) among Students at SMPLB-A and SMALB-A YPAB Surabaya, 2024

Oral Hygiene Status	Frequency	Percentage
Good	0	0%
Fair	8	33,3%
Poor	16	66,7%
Total	24	100%

E. Relationship Between Parental Understanding of Oral and Dental Hygiene Practices and the Oral Hygiene Condition of Visually Impaired Students at SMPLB-A and SMALB-A YPAB Surabaya

TABLE 5
Correlation Between Parental Knowledge of Dental Health Care and Oral Hygiene Among Visually Impaired Students at SMPLB-A and SMALB-A YPAB Surabaya

Parental Knowledge Categories	Oral Hygiene Status			Total	ρ value
	Good	Fair	Poor		
	N	N	N		
Moderate	0	0	14	14	
Low	0	0	2	2	0,000
High	0	7	1	8	
Total	0	7	17	24	

TABLE 5 indicates a significant result ($\rho = 0.000 < \alpha = 0.05$), demonstrating a significant relationship between parental knowledge of oral health maintenance and the oral hygiene status of visually impaired students at SMPLB-A and SMALB-A YPAB Surabaya. Therefore, H_1 is accepted and H_0 is rejected.

IV. DISCUSSION

A. INTERPRETATION OF THE RELATIONSHIP BETWEEN PARENTAL KNOWLEDGE AND ORAL HYGIENE STATUS

The findings of this study demonstrate a strong and statistically significant relationship between parents' knowledge of oral and dental health maintenance and the oral hygiene status of visually impaired students at SMPLB-A and SMALB-A YPAB Surabaya. The high Spearman correlation coefficient indicates that parental knowledge plays a decisive role in determining the oral hygiene outcomes of children with visual impairments. This result reinforces the conceptual understanding that children with sensory disabilities are highly dependent on external guidance, particularly from parents or primary caregivers, for the execution of daily health-related behaviors.

The predominance of moderate-to-low parental knowledge observed in this study provides a plausible explanation for the generally poor oral hygiene status among the participating students. In the absence of visual feedback, visually impaired children rely almost exclusively on verbal instruction, tactile demonstration, and consistent supervision to perform effective tooth brushing and oral care routines. When parental knowledge is insufficient, guidance provided to the child may be inaccurate, inconsistent, or incomplete, leading to suboptimal oral hygiene practices. This finding aligns with health behavior theories, particularly the PRECEDE-PROCEED model, which identifies knowledge as a key predisposing factor influencing health behavior formation [31].

Furthermore, the absence of any participants classified as having "good" oral hygiene underscores the cumulative impact of limited parental knowledge and structural barriers, such as inadequate access to disability-adapted dental education and preventive services. The mean OHI-S score observed in this study exceeded national benchmarks, indicating a clinically relevant level of oral hygiene deficiency. These findings suggest that parental knowledge is not merely an auxiliary factor but a central determinant in maintaining oral health among visually impaired children.

Importantly, the results highlight that parental knowledge does not operate in isolation but interacts with behavioral reinforcement and caregiving consistency. Parents with higher levels of oral health knowledge were more likely to supervise brushing routines, emphasize appropriate brushing duration and technique, and facilitate dental visits, thereby contributing to relatively better oral hygiene outcomes among their children. This interpretation supports the assertion that improving caregiver knowledge can directly translate into improved child health behaviors, particularly in populations with functional limitations [32].

B. COMPARISON WITH PREVIOUS STUDIES

The findings of this study are largely consistent with previous research conducted in both national and international contexts. Several studies have reported that visually impaired children exhibit poorer oral hygiene status compared to sighted children, primarily due to difficulties in self-assessment and limited motor coordination [33], [34]. Similar to the present study, Macharia et al. [35] reported that a majority of visually impaired adolescents demonstrated poor plaque control and irregular brushing habits, emphasizing the importance of caregiver involvement.

In terms of parental influence, the results corroborate findings by Alimorad et al. [36], who identified a significant association between parental awareness and oral health outcomes, including DMFT and plaque indices, among visually impaired children. Likewise, Lee et al. [37] demonstrated that higher parental oral health literacy was associated with improved oral hygiene behaviors in children, reinforcing the role of caregiver knowledge as a predictive factor. These consistencies suggest that the relationship observed in the current study reflects a broader and robust pattern across diverse populations.

However, some contrasts with existing literature should be noted. Intervention-based studies have reported more favorable oral hygiene outcomes among visually impaired children following structured educational programs involving multisensory approaches, such as tactile models and Braille-based instructions [38], [39]. In contrast, the present study reflects baseline conditions without targeted intervention, which may explain the uniformly poor oral hygiene outcomes observed. This contrast highlights the potential effectiveness of educational interventions and suggests that the poor outcomes identified in this study are not inevitable but modifiable.

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Additionally, studies conducted in high-income settings often report slightly better oral hygiene outcomes among visually impaired children, attributed to greater access to specialized dental services and inclusive health education programs [40]. The comparatively poorer outcomes observed in this Indonesian context underscore the influence of systemic and contextual factors, including limited caregiver training opportunities and resource constraints. These differences emphasize the need for context-specific strategies that account for local healthcare infrastructure and sociocultural dynamics.

C. STUDY LIMITATIONS AND IMPLICATIONS FOR PRACTICE AND FUTURE RESEARCH

Despite its contributions, this study has several limitations that should be considered when interpreting the findings. First, the cross-sectional design limits the ability to infer causality between parental knowledge and oral hygiene status. While a strong association was identified, longitudinal studies are required to establish temporal relationships and causal pathways. Second, the relatively small sample size, although inclusive of the entire accessible population, may limit the generalizability of the findings to other settings or populations.

Another limitation relates to the use of a self-reported questionnaire to assess parental knowledge. Although the instrument demonstrated acceptable validity and reliability, self-report measures are inherently subject to response bias, including social desirability bias. Parents may overestimate their knowledge or provide responses perceived as socially acceptable. Additionally, the study did not account for other potential confounding variables, such as socioeconomic status, frequency of professional dental visits, or children's level of independence, which may also influence oral hygiene outcomes.

Despite these limitations, the findings have important practical and policy implications. The strong association between parental knowledge and oral hygiene status underscores the need for caregiver-centered oral health promotion strategies. Dental health programs targeting visually impaired children should prioritize parental education as a core component, incorporating accessible teaching methods, practical demonstrations, and culturally appropriate materials. Integrating parental training into school-based oral health programs may enhance sustainability and long-term impact.

For future research, longitudinal and intervention-based studies are recommended to evaluate the effectiveness of structured parental education programs on improving oral hygiene outcomes in visually impaired children. Further research should also explore the role of digital and assistive technologies in supporting caregiver education and child oral health practices. Expanding the scope of investigation to include broader psychosocial and environmental determinants would provide a more comprehensive understanding of oral health disparities in this vulnerable population.

In conclusion, this study highlights parental knowledge as a critical determinant of oral hygiene status among visually impaired children. Addressing knowledge gaps through targeted educational interventions has the potential to significantly improve oral health outcomes and reduce inequalities faced by children with visual impairments.

V. CONCLUSION

This study aimed to examine the relationship between parents' knowledge of oral and dental health maintenance and the oral hygiene status of visually impaired students at SMPLB-A and SMALB-A YPAB Surabaya. The findings provide clear empirical evidence that parental knowledge is strongly associated with oral hygiene outcomes in this vulnerable population. The results demonstrated that the majority of parents possessed a moderate level of knowledge regarding oral health maintenance (58.3%), while only 33.3% exhibited high knowledge and a smaller proportion showed low knowledge. Correspondingly, none of the visually impaired students achieved a "good" oral hygiene status. Most students were classified as having poor oral hygiene (66.7%), while the remaining 33.3% fell into the fair category. The mean Simplified Oral Hygiene Index (OHI-S) score was 3.49, which substantially exceeded the national target value of ≤ 1.2, indicating a clinically concerning level of oral hygiene deficiency. Statistical analysis using the Spearman rank correlation test revealed a strong and statistically significant association between parental knowledge and oral hygiene status ($\rho = 0.848$; $p < 0.05$), confirming that higher parental knowledge is linked to better oral hygiene outcomes among visually impaired children. These findings underscore the critical role of parents as primary caregivers and health facilitators, particularly for children with visual impairments who depend heavily on verbal instruction, tactile guidance, and consistent supervision to perform daily oral care practices. The study highlights that inadequate parental knowledge may contribute to improper brushing techniques, insufficient supervision, and delayed utilization of dental services, thereby exacerbating poor oral hygiene conditions. In terms of future work, longitudinal and intervention-based studies are recommended to establish causal relationships and evaluate the effectiveness of structured parental education programs on improving oral hygiene outcomes in visually impaired children. Future research should also explore the integration of assistive technologies, multisensory educational tools, and school-based caregiver training programs to enhance parental engagement and oral health literacy. Expanding the scope of investigation to include socioeconomic, environmental, and healthcare access factors would further enrich understanding and support the development of comprehensive, sustainable oral health promotion strategies for children with visual impairments.

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DATA AVAILABILITY

The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request.

AUTHOR CONTRIBUTION

S.K.S. conceptualized the study, designed the methodology, conducted data collection, and drafted the original manuscript. I. contributed to study supervision, methodological refinement, and critical revision of the manuscript. S.H. assisted in data analysis, interpretation of results, and manuscript editing. All authors reviewed and approved the final version of the manuscript and agree to be accountable for all aspects of the work.

DECLARATIONS

ETHICAL APPROVAL

This study was approved by the Ethics Committee of Poltekkes Kemenkes Surabaya. All procedures were conducted in accordance with ethical standards and the Declaration of Helsinki.

CONSENT FOR PUBLICATION PARTICIPANTS.

Written informed consent for participation and publication was obtained from the parents or legal guardians of all participating students.

COMPETING INTERESTS

The authors declare that they have no competing interests.

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