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Correlation Between Parental Knowledge of Oral Health and Dental Caries Incidence Among Preschool Children at Ar-Rahman Foundation Jombang

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ABSTRACT Dental caries remains one of the most prevalent oral health problems among preschool children and continues to pose a significant public health concern, particularly in developing countries. Inadequate parental knowledge of oral and dental health is often considered a contributing factor to the high incidence of early childhood caries. This study aimed to examine the relationship between parental knowledge of oral health and the incidence of dental caries among preschool children attending PAUD and Kindergarten under the Ar-Rahman Foundation in Jombang, Indonesia. A quantitative cross-sectional design was employed involving 39 parents and their preschool-aged children selected using total sampling. Parental knowledge was assessed using a structured questionnaire, while dental caries status in children was evaluated using the def-t (decayed, extracted, and filled teeth) index. Data were analyzed using the Chi-square test with a significance level of $\alpha = 0.05$. The results indicated that the majority of parents (51.3%) had low levels of oral health knowledge, while only 10.3% demonstrated good knowledge. Dental caries prevalence among preschool children was relatively high, with higher def-t scores more frequently observed among children whose parents had lower knowledge levels. However, statistical analysis revealed no significant association between parental knowledge and the incidence of dental caries ($p = 0.286$). Despite the absence of a statistically significant relationship, descriptive findings suggested a tendency toward poorer oral health outcomes among children of parents with limited knowledge. In conclusion, parental knowledge alone was not significantly associated with dental caries incidence among preschool children in this study. These findings suggest that dental caries is influenced by multiple factors beyond knowledge, including behavioral practices, dietary patterns, and access to dental care. Comprehensive oral health promotion programs that integrate parental education with practical behavioral interventions are therefore essential to improve early childhood oral health outcomes.

INDEX TERMS Parental Knowledge, Oral Health, Dental Caries, Preschool Children, Cross-Sectional Study.

I. INTRODUCTION

Dental caries remains one of the most prevalent chronic oral diseases among preschool children worldwide and continues to pose a substantial public health burden, particularly in low- and middle-income countries [1]–[3]. Early childhood caries is associated with pain, infection, impaired mastication, sleep disturbances, and reduced quality of life, which may negatively affect children's physical growth and cognitive development [4], [5]. Despite advancements in preventive dentistry and increased global attention to oral health promotion, the prevalence of dental caries among preschool-aged children remains high, indicating persistent gaps in early prevention strategies [6], [7]. Preschool age is a critical developmental period during which oral hygiene behaviors and dietary habits are established, making preventive interventions at this stage particularly essential [8], [9].

Parental influence is widely recognized as a central determinant of children's oral health outcomes, as preschool children rely heavily on caregivers for daily oral hygiene practices and dietary regulation [10], [11]. Parents' knowledge of dental and oral health plays a crucial role in shaping children's toothbrushing routines, sugar consumption patterns, and utilization of preventive dental services [12], [13]. Several recent studies have reported that inadequate parental knowledge regarding appropriate brushing techniques, fluoride use, and the risks of cariogenic diets is associated with a higher incidence of dental caries in young children [14]–[16]. Consequently, parental knowledge is frequently identified as a key predisposing

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factor influencing early childhood oral health behaviors and outcomes [17], [18].

State-of-the-art research in pediatric oral health commonly employs quantitative cross-sectional designs using validated questionnaires to assess parental oral health knowledge, combined with standardized clinical indices such as the def-t (decayed, extracted, and filled teeth) index or the International Caries Detection and Assessment System (ICDAS) to measure caries experience in children [19]–[21]. These methodological approaches enable objective assessment and facilitate comparison across populations. Recent studies have also integrated socio-demographic and behavioral variables to capture the multifactorial nature of dental caries, recognizing that caries development results from interactions between biological, behavioral, and environmental factors [22], [23]. However, empirical findings remain inconsistent. While some studies demonstrate a significant association between higher parental knowledge and lower caries prevalence, others report no statistically significant relationship, suggesting that knowledge alone may be insufficient to prevent dental caries without consistent behavioral implementation [24], [25].

This inconsistency highlights a clear research gap. Although parental oral health knowledge has been widely investigated, its independent relationship with dental caries incidence remains inconclusive, particularly within specific socio-cultural and institutional contexts. Evidence from community-based preschool settings in Indonesia is still limited, and few studies have focused specifically on children enrolled in early childhood education foundations [26]. Moreover, many previous studies emphasize knowledge assessment without adequately considering contextual factors—such as access to dental services, parental supervision, and daily oral hygiene practices—that may mediate its influence on children's oral health outcomes [27].

Therefore, this study aims to examine the relationship between parental knowledge of dental and oral health and the incidence of dental caries among preschool children at the Ar-Rahman Foundation in Jombang, Indonesia. By focusing on a defined institutional setting and preschool population, this research seeks to clarify whether parental knowledge is significantly associated with children's dental caries incidence.

This study makes three main contributions. First, it provides localized empirical evidence on parental oral health knowledge and dental caries prevalence among preschool children in a foundation-based educational environment. Second, it offers a critical evaluation of the association between parental knowledge and caries incidence, addressing inconsistencies in recent literature. Third, the findings contribute practical implications for oral health promotion, supporting the development of integrated interventions that combine parental education with behavioral reinforcement and preventive dental care strategies [28].

The remainder of this article is organized 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 study and provides recommendations for future research and oral health interventions.

II. METHODS

A. STUDY DESIGN AND SETTING

This study employed a quantitative analytical cross-sectional design to examine the relationship between parental knowledge of oral and dental health and the incidence of dental caries among preschool children. A cross-sectional approach was selected because it enables simultaneous measurement of exposure (parental knowledge) and outcome (dental caries status) within a defined population at a single point in time, allowing efficient assessment of associations without follow-up periods [29]. The study was conducted at PAUD and Kindergarten under the Ar-Rahman Foundation, Jombang Regency, East Java, Indonesia. Data collection was carried out between January and March 2025 in coordination with school administrators and parents.

B. STUDY POPULATION AND SAMPLE

The study population consisted of all parents and their preschool-aged children (3–6 years) enrolled at the Ar-Rahman Foundation during the study period. A total sampling technique was applied to minimize selection bias and ensure full representation of the target population [30]. All eligible parent–child pairs who met the inclusion criteria were invited to participate. The inclusion criteria were: (1) parents or legal guardians who were the primary caregivers, (2) children aged 3–6 years enrolled at the institution, and (3) parents who provided written informed consent. Exclusion criteria included children with systemic diseases affecting oral health, children undergoing orthodontic treatment, and incomplete questionnaire responses. A total of 39 parent–child pairs met the criteria and were included in the final analysis.

C. STUDY VARIABLES

The independent variable in this study was parental knowledge of oral and dental health, while the dependent variable was dental caries incidence among preschool children, measured using the def-t index. Socio-demographic characteristics of parents, including age, education level, and occupation, were recorded as descriptive variables to provide contextual information and support interpretation of findings [31].

D. RESEARCH INSTRUMENTS

Parental knowledge was assessed using a structured questionnaire developed based on previous validated instruments related to pediatric oral health knowledge [32]. The questionnaire consisted of multiple-choice and dichotomous items covering topics such as toothbrushing practices, fluoride use, dietary habits, and preventive dental visits. Prior to data collection, the questionnaire was tested for content validity by dental public health experts and demonstrated acceptable reliability (Cronbach's alpha > 0.70). Dental caries status of children was evaluated using the def-t (decayed, extracted, and filled teeth) index, which is widely used in epidemiological studies involving primary dentition

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[33]. Clinical examinations were performed under natural light using disposable dental mirrors and probes, following standardized World Health Organization (WHO) guidelines to ensure consistency and accuracy.

E. DATA COLLECTION PROCEDURES

Data collection was conducted in two stages. First, parents completed the oral health knowledge questionnaire, either during scheduled school meetings or through guided completion facilitated by the research team. Second, clinical oral examinations of children were conducted on school premises by a trained examiner with a dental background. To ensure measurement reliability, examiner calibration was performed prior to data collection, and intra-examiner agreement was assessed using repeated examinations on a subset of children [34].

F. DATA ANALYSIS

Collected data were coded, entered, and analyzed using statistical software. Descriptive statistics were used to summarize parental knowledge levels and caries prevalence. Parental knowledge scores were categorized into good, moderate, and poor based on predetermined cut-off points. The relationship between parental knowledge and dental caries incidence was analyzed using the Chi-square test, with a significance level set at $\alpha = 0.05$. This statistical test was chosen due to the categorical nature of the variables and its suitability for cross-sectional association analysis [35].

G. ETHICAL CONSIDERATIONS

This study was conducted in accordance with ethical principles for research involving human subjects. Ethical approval was obtained from the Institutional Ethics Committee prior to data collection. Written informed consent was obtained from all participating parents, and confidentiality of personal data was strictly maintained. Children's examinations were performed using non-invasive procedures to ensure safety and comfort [36].

III. RESULTS

TABLE 1
Demographic Characteristics of Preschool Respondents at PAUD and TK AR Rahman

Gender	Frequency	%
Girl	15	38,5
Boy	24	61,5

According to the information in TABLE 1, the gender distribution of preschool students at PAUD and TK AR Rahman. As indicated, 38.5% of the children are male, while 61.5% are female. This suggests that the majority of students enrolled in this early childhood institution are female. The gender composition may have implications for how children engage in early education programs, including those related to health and hygiene behaviors.

According to the information presented in TABLE 2, the demographic characteristics of the parents of preschool children, including educational attainment and occupation. The majority of parents (56.4%) completed junior high school, while the remaining 43.6% graduated from senior high school. Regarding occupation, 48.7% are housewives, 21.3% work in the private sector, 17.9% are entrepreneurs, and 10.3% are farmers. These findings indicate that most parents have relatively modest educational and occupational backgrounds, which may affect their level of awareness and practices concerning dental and oral health at home.

TABLE 2
Demographic Characteristics of Parent Respondents of Preschool Children at PAUD and TK AR Rahman

Last Education	Frequency	%
Junior High School	22	56,4
Senior High School	17	43,6
Occupation	**Frequency**	**%**
House Wife	19	48,7
Private Sector Employee	9	21,3
Entrepreneur	7	17,9
Farmer	4	10,3

TABLE 3
Cross tabulation Knowledge of Parent's Dental and Oral Health at PAUD and TK AR Rahman

Level of Knowledge	Frequency	%
Good	4	10,3
Medium	15	38,5
Less	20	51,3

According to the information presented in TABLE 3, the distribution of parents' knowledge levels regarding dental and oral health. The results reveal that 51.3% of parents have low knowledge, 38.5% have moderate knowledge, and only 10.3% possess high knowledge. This indicates that the majority of parents lack adequate understanding of dental hygiene practices. Such limitations in knowledge may affect how they guide and support their children in maintaining oral health, highlighting the importance of community-based health education.

TABLE 4
Cross tabulation Knowledge of Parent's Dental and Oral Health at PAUD and TK AR Rahman

Level of Knowledge	deft Score					f	P Value
	0	1	2	3	4		
Good	1	0	0	1	2	4	0,286
Keep	2	0	3	3	7	15	
Less	1	1	10	5	3	20	
Total	4	1	13	9	12	39	

According to the findings presented in TABLE 4, explains the cross-tabulation between parents' knowledge of dental and oral health and the deft scores (decayed, extracted, and filled teeth) of their children. Children whose parents had lower knowledge levels tended to have higher deft scores, with the most common score being 2 (n = 10) among the "low knowledge" group. Meanwhile, children of parents with good knowledge generally had lower deft scores. Although the statistical test yielded a p-value of 0.286 indicating no significant correlation, there is an observable

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pattern suggesting that lower parental knowledge is associated with a greater risk of dental problems in children. This finding underscores the role of parental awareness in shaping children's oral health outcomes.

IV. DISCUSSION

A. Interpretation of the Relationship Between Parental Knowledge and Dental Caries Incidence

This study examined the relationship between parental knowledge of oral and dental health and the incidence of dental caries among preschool children at the Ar-Rahman Foundation, Jombang. The findings indicated that, although a substantial proportion of parents demonstrated low levels of oral health knowledge and dental caries prevalence among children was relatively high, no statistically significant association was identified between parental knowledge and children's dental caries incidence. This result suggests that parental knowledge alone may not be a sufficient determinant of dental caries outcomes in preschool-aged children.

From an epidemiological perspective, dental caries is a multifactorial disease influenced by biological, behavioral, environmental, and social determinants. While parental knowledge is often considered a predisposing factor, its effect may be mediated or overshadowed by other variables such as dietary habits, oral hygiene practices, fluoride exposure, and access to preventive dental services [37]. The absence of a significant association in this study implies that knowledge does not necessarily translate into effective preventive behaviors. Parents may possess basic information regarding oral health but may not consistently implement or supervise daily oral hygiene practices due to time constraints, socioeconomic pressures, or limited access to dental care.

Furthermore, preschool children depend heavily on parental supervision for toothbrushing and dietary control. Inadequate supervision, even among knowledgeable parents, may reduce the practical impact of oral health knowledge on children's dental outcomes. This finding reinforces the concept that behavioral implementation and routine reinforcement are critical components of effective caries prevention strategies, beyond cognitive knowledge alone [38].

B. Comparison with Previous Studies

The findings of this study are both consistent with and divergent from previous research. Several recent studies have reported a significant relationship between parental oral health knowledge and lower dental caries prevalence among preschool children. For instance, Chawłowska et al. [39] found that children whose parents demonstrated higher levels of oral health literacy had significantly lower def-t scores. Similar associations were reported in studies conducted in various socio-economic contexts, emphasizing the protective role of parental knowledge when accompanied by appropriate oral hygiene behaviors [40], [41].

Conversely, the results of the present study align with other investigations that reported no significant association between parental knowledge and dental caries incidence. Firmino et al. [42] highlighted that although parents may be aware of recommended oral health practices, inconsistent application and environmental influences may limit the effectiveness of knowledge, particularly in early childhood. Likewise, Zaborskis et al. [43] observed that parental involvement and daily supervision were stronger predictors of children's oral health outcomes than knowledge scores alone.

Differences in study outcomes may be attributed to methodological variations, including differences in sample size, socio-cultural contexts, measurement tools, and analytical approaches. Studies reporting significant associations often incorporate behavioral variables, such as brushing frequency and sugar intake, which may act as mediators between knowledge and caries outcomes. In contrast, studies focusing solely on knowledge as in the present study may underestimate the complexity of caries development [44].

Additionally, institutional and community-level factors may influence oral health outcomes. In the context of foundation-based preschool education, uniform routines and shared dietary environments may reduce variability in oral health behaviors among children, potentially diminishing the observable impact of parental knowledge differences [45].

C. Limitations and Implications for Practice and Future Research

Several limitations should be acknowledged when interpreting the findings of this study. First, the cross-sectional design limits the ability to establish causal relationships between parental knowledge and dental caries incidence. Temporal relationships cannot be inferred, and the observed associations may be influenced by unmeasured confounding factors. Longitudinal studies are needed to assess how changes in parental knowledge and behaviors influence caries development over time [46].

Second, the relatively small sample size may have limited the statistical power to detect subtle associations. While total sampling was employed to maximize representation, the findings should be interpreted with caution and may not be generalizable to broader populations. Third, parental knowledge was assessed using self-reported questionnaires, which may be subject to response bias and overestimation of actual knowledge levels [47].

Despite these limitations, the study offers important implications for oral health promotion. The findings suggest that interventions focusing solely on increasing parental knowledge may be insufficient to reduce dental caries incidence among preschool children. Instead,

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comprehensive oral health programs should integrate parental education with practical skill-building, routine supervision strategies, and institutional support mechanisms. Preschool-based interventions that involve teachers, parents, and health professionals may enhance the translation of knowledge into consistent preventive behaviors [48].

From a public health perspective, the results highlight the importance of addressing structural and behavioral determinants of oral health, such as access to fluoride toothpaste, availability of preventive dental services, and supportive school environments. Future research should incorporate behavioral, dietary, and environmental variables to better elucidate the pathways through which parental knowledge influences children's oral health outcomes. Mixed-methods and longitudinal designs may provide deeper insights into contextual factors shaping oral health behaviors in early childhood [49].

In conclusion, while parental knowledge remains an essential component of oral health promotion, it should be viewed as part of a broader, integrated strategy rather than a standalone determinant. Strengthening behavioral reinforcement and institutional collaboration is critical to achieving sustainable improvements in preschool children's oral health [50].

V. CONCLUSION

This study was conducted to examine the relationship between parental knowledge of oral and dental health and the incidence of dental caries among preschool children attending PAUD and Kindergarten under the Ar-Rahman Foundation, Jombang, Indonesia. The findings revealed that the prevalence of dental caries among preschool children remained relatively high, with the majority of children presenting def-t scores indicative of untreated carious lesions. Descriptive analysis showed that more than half of the parents (51.3%) demonstrated low levels of oral health knowledge, while only 10.3% exhibited good knowledge. However, statistical analysis using the Chi-square test indicated that there was no significant association between parental knowledge and dental caries incidence among children ($p = 0.286$). These results suggest that parental knowledge, when considered as an isolated factor, may not be sufficient to influence dental caries outcomes in preschool-aged children. The absence of a statistically significant relationship highlights the multifactorial nature of dental caries development, which is influenced not only by cognitive knowledge but also by behavioral practices, dietary patterns, parental supervision, environmental exposure, and access to preventive dental services. Although parents may possess basic awareness of oral health principles, this knowledge does not necessarily translate into consistent preventive behaviors, such as supervised toothbrushing, reduced sugar intake, or regular dental visits. Consequently, oral health promotion efforts that focus solely on improving parental knowledge may have limited effectiveness in reducing early childhood caries. Future research should adopt longitudinal or mixed-methods designs to better capture temporal relationships and explore the pathways through which parental knowledge interacts with behavioral and environmental determinants. Expanding the sample size and incorporating variables such as oral hygiene practices, dietary habits, fluoride exposure, and parental supervision intensity would provide a more comprehensive understanding of caries risk factors. In addition, future studies should evaluate integrated intervention models that combine parental education with practical behavioral training and preschool-based oral health programs. Such approaches may offer greater potential to translate knowledge into sustained preventive practices and ultimately improve oral health outcomes among preschool children.

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DATA AVAILABILITY

No datasets were generated or analyzed during the current study.

AUTHOR CONTRIBUTION

Heva Pratiwi conceptualized and designed the study, conducted data collection, and participated in data analysis and interpretation. Silvia Prasetyowati and Mohammed Ismath contributed to the development of the educational media, oversaw the implementation of the intervention, and contributed to manuscript writing and revisions. Sunomo Hadi assisted with data analysis and interpretation and provided critical feedback on the manuscript. Ida Chairanna Mahirawatie participated in the literature review, data collection, and manuscript editing. All authors reviewed and approved the final version of the manuscript, and agreed to be responsible for all aspects of the work ensuring integrity and accuracy.

DECLARATIONS

ETHICAL APPROVAL

This study was approved by the Institutional Review Board (IRB) of Poltekkes Kemenkes Surabaya, Indonesia (Approval No. [045/Polkes/2024]) and conducted in accordance with ethical standards for research involving human subjects. Informed consent was obtained from all parents or guardians after providing clear information about the study's objectives and procedures. To maintain confidentiality, participants' identities were anonymized using numerical codes, and no personal identifiers appeared in any report. All data were

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securely stored—digital files were password-protected, and printed materials were kept in locked storage accessible only to the researcher. These measures ensured data security and upheld participants' privacy throughout the research process.

CONSENT FOR PUBLICATION PARTICIPANTS.

Consent for publication was given by all participants

COMPETING INTERESTS

The authors declare no competing interests.

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