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Research Article

Intergenerational Relationship Between Parental and Their Children' Gingivitis In Indonesia: A Life Course Approach

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KEYWORDS

Children, gingivitis, intergenerational, life course approach

ABSTRACT

Introduction: Gingivitis, a reversible inflammatory condition, is the second most prevalent oral health issue in children, after dental caries. A national health survey in 2018 revealed a high prevalence of gingivitis among Indonesian children, with 5.8% among 5-year-old and 14.3% among 12-year-old children. Childhood is a critical period for the development of oral health behaviors, which are influenced by genetic, familial, and environmental factors. Research highlights the intergenerational transmission of gingivitis, linking parental oral health to child's outcomes. This study aimed to analyze the relationship between the occurrence of gingivitis among parents and their 3--14-year-old children in Indonesia.

Materials and Methods: Cross-sectional study using secondary data from the 2018 Riskesdas. The data were collected by the Republic of Indonesia Ministry of Health's Research and Development in March 2018. The subject criteria were 3--14-year-old children and their biological parents who had clinical data on gingivitis status and interviews for behavioral variables. Data analysis was performed using SPSS ver.27 for univariate and bivariate analyses.

Results and Discussion: The relationship between the occurrence of gingivitis in parents and children was significant ($p < .001$). The parental risk factors included parents' perceptions of oral health problems. Parents' habits were also significantly related to their children's habits.

Conclusion: The significant relationship between the occurrence of gingivitis among parents and children, and the significant role of parents in shaping their children's oral health behaviors were in accordance with the concept of the intergenerational life course.

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INTRODUCTION

Gingivitis is a common inflammatory condition of the periodontium that affects the gingiva without causing clinical attachment loss, making it a reversible disease.[1] Clinically, gingivitis is characterized by reddened, swollen, and easily bleeding gums; however, in children, it may not be apparent in its early stages because the gingival tissue conceals inflammation.[2] Children generally experience milder forms of gingivitis than adults, which may be linked to differences in plaque accumulation.[3] After dental caries, gingivitis is the second most frequent condition among children, with studies showing high prevalence rates, such as 68% among 12-year-olds in Jakarta and its satellite cities.[4] Data from Indonesia's 2018 Basic Health Research survey (*Riskesdas*) indicated that bleeding gums, a key indicator of gingivitis, were reported in 5.8% of 5-year-olds and 14.3% of 12-year-olds.[5]

Periodontal problems in adulthood often originate in childhood, and significant levels of gingivitis can affect children's perceptions of their oral health.[6] Establishing health-promoting behaviors early in life can help prevent conditions such as gingivitis.[7] Dental plaque formation plays a key role in periodontal disease development and is influenced by modifiable risk factors.[8] Familial patterns of periodontal disease suggest that susceptibility may be inherited. A study revealed a correlation between parental and children's periodontal disease in their children, indicating that genetic vulnerability, shared behaviors, and environmental factors are involved.[9]

The life course approach has gained attention in recent years for understanding the origins of diseases. This approach explores how physical or social exposures during various life stages, from pregnancy to adulthood, affect future health outcomes. The life course perspective also emphasizes the role of families, especially mothers, in shaping exposure and health-related behaviors.[10, 11] Life course research not only delves into the influences on health that occur throughout an individual's lifespan but also encompasses factors that span generations. Intergenerational research suggests that familial risk factors contribute to dental issues in children, with studies indicating the need for broader examinations of intergenerational persistence in oral health.[12, 13]

Given the prevalence, impact, and intergenerational potential of gingivitis in children, along with the limited research in Indonesia, a study could explore the relationship between gingivitis in parents and children aged 3-14 years using an intergenerational life course approach. Secondary data from the 2018 *Riskesdas* (Basic Health Research), a national-scale survey that collected information through interviews, measurements, and examinations, can be used to identify children at high risk of gingivitis. Thus, this study aimed to determine the relationships between the occurrence of parental gingivitis and risk factors and the occurrence of gingivitis in children aged 3--14 years in Indonesia.

MATERIALS AND METHODS

This is an observational cross-sectional study using secondary data from the 2018 Basic Health Research survey (*Riskesdas*). Data collection, including interviews and clinical examinations, was conducted in March 2018 in 26 provinces, consisting of 106 regions and cities in Indonesia. Data analysis was performed at the Faculty of Dentistry, University of Indonesia, from September to December 2024. The target population in this study included all children aged 3--14 years and their biological mothers and fathers who underwent

clinical examinations and interviews for the 2018 *Riskesdas* in Indonesia. The source population was the 2018 *Riskesdas* secondary data for dental and oral examinations consisting of 25,000 households selected randomly by the Central Bureau of Statistics. The sample used was children aged 3--14 years based on the age recorded during the 2018 *Riskesdas* survey, for which "Bleeding on Probing" (BOP index) examination results were obtained for children and fathers and/or mothers. Gingival bleeding was examined by walking probing using the WHO CPI Probe, which was observed one minute after probing. Gingival bleeding was scored as 0 if there was no bleeding on the gingiva and 1 if there was bleeding on the gingiva. "Biological Children" is a subject criterion, as seen in the "Relationship between ART and Head of Household". Subjects who did not meet the inclusion criteria were excluded from the study.[14]

Other independent variable information was obtained through interviews using the 2018 *Riskesdas* individual questionnaire (RKD18 IND) and the 2018 *Riskesdas* household questionnaire (RKD18 RUTA). Data concerning parental factors such as sweet consumption, such as sugary snacks and carbonated drinks; healthy food, such as fruits and vegetables; toothbrushing; smoking; and perceptions about oral health problems related to gingivitis were obtained from the questionnaires.[5] The correct toothbrushing method according to evidence-based dentistry was at least twice a day, and the timing should be at night before sleeping and one other time during the day.[14]

Data preparation involved cleaning, weighting, and transforming variables using SPSS Statistics 27.0 to ensure completeness and accuracy. Univariate analysis provided an overview of the sample characteristics, whereas bivariate analysis explored the relationships between independent variables and the occurrence of gingivitis. The research adhered to ethical standards, with approval from the Dental Research Ethics Commission (KEPKG) of the Faculty of Dentistry, University of Indonesia, with letter number 40/Ethical Approval /FKGUI/IX/2023 and protocol number 010620823.

RESULTS & DISCUSSIONS

A total of 3,529 children aged 3-14 years underwent dental examinations, and the samples included those with bleeding on probing (BOP) test results for both children and their biological parents. After excluding 266 samples for which neither parent had BOP data and 143 samples for which the parents were not biological children, 3,120 samples remained for the analysis. The occurrence of gingivitis, which was indicated by the bleeding on probing index (BOP), was 36.7% for children aged 3--14 years, with a mean of 2.67 teeth (95% CI: 2.48--2.86). The prevalence of gingivitis in the parents of the children was 30.3% for fathers and 26.2% for mothers. The average number of bleeding teeth was slightly higher for fathers than for mothers, at 6.98 (95% CI: 6.68--7.33) for fathers and 6.92 (95% CI: 6.64--7.20) for mothers.

Table 1 shows the relationships between parental factors, such as parental gingivitis, perceptions of oral health problems, tooth brushing methods, consumption of sweet and healthy foods, and smoking, and the occurrence of gingivitis in children.

Table 1. Relationships between parental factors and gingivitis occurrence in children

	Children' gingivitis occurrence		*p* value	OR (95% CI)
	Yes n(%)	No n(%)		
Father's gingivitis occurrence (n=3120)				
Yes	990 (45.5)	1186 (54.5)	< .001	3.351
No	154 (16.3)	790 (83.7)		(2.744-4.091)
Mother's gingivitis occurrence (n=3120)				
Yes	998 (43.3)	1305 (56.7)	< .001	2.459
No	146 (17.9)	671 (82.1)		(1.998-3.026)
Father's toothbrushing according to EBD (n=2815)				
No	810 (37.9)	1327 (62.1)	.083	1.135
Yes	232 (34.2)	446 (65.8)		(0.944-1.365)
Mother's toothbrushing according to EBD (n=3037)				
No	739 (37.3)	1242 (62.7)	.411	1.018
Yes	378 (35.8)	678 (64.2)		(0.869-1.192)
Father's perception of oral health problem (n=2815)				1.929
Poor	747 (42.6)	1005 (57.4)	< .001	(1.636-2.274)
Good	295 (27.8)	768 (72.2)		
Mother's perception of oral health problem (n=3037)				
Poor	808 (42.4)	1099 (57.6)	< .001	1.960
Good	309 (27.3)	821 (72.7)		(1.670-2.299)
Father's sweet consumption frequency (n=2815)				
Often	905 (37.1)	1353 (62.9)	.835	1.009
Rarely	137 (36.5)	238 (63.5)		(0.800-1.271)
Mother's sweet consumption frequency (n=3037)				
Often	850 (35.9)	1519 (64.1)	.053	0.831
Rarely	267 (40.0)	401 (60.0)		(0.695-0.994)
Father's healthy consumption frequency (n=2815)				
Rarely	474 (39.3)	732 (60.7)	.030	1.163
Often	568 (35.3)	1041 (64.7)		(0.994-1.361)
Mother's healthy consumption frequency (n=3037)				
Rarely	429 (38.8)	676 (61.2)	.077	1.178
Often	688 (35.6)	1244 (64.4)		(1.008-1.375)
Father's smoking habit (n=2815)				
Smoker	783(37.9)	1282(62.1)	.248	1.061 (0.968-
Non smoker	259 (34.5)	491 (65.5)		1.163)
Mother's smoking habit (n=3037)				
Smoker	1087 (36.6)	1886 (63.4)	.174	1.254 (0.958-
Non smoker	30 (36.4)	34 (63.6)		1.643)

Chi-square test

This study highlights a significant intergenerational relationship between the occurrence of gingivitis in parents and children aged 3-14 years in Indonesia. The results revealed that children of parents with gingivitis, particularly those with gingival bleeding, were more likely to develop gingivitis. Parents with gingival bleeding had a significantly greater risk of having children with gingival bleeding, with the risk being 3.351 and 2.459 times greater for fathers and mothers, respectively. These findings are consistent with those of previous studies, which reported a significant association between parents' periodontitis and their children's periodontitis status. This study emphasizes that parental periodontal health can serve as a predictor of children's oral health.[15]

Regarding toothbrushing habits, only 24.1% of fathers and 34.8% of mothers brushed their teeth according to evidence-based dentistry guidelines, while the majority did not follow recommended practices. Parents' toothbrushing habits did not significantly influence the occurrence of gingivitis in children, although the children of parents who adhered to the EBD guidelines had a slightly lower prevalence of gingivitis. These findings echo the results of a study in Cimahi, Indonesia, where

parents' toothbrushing habits were not significantly correlated with their children's oral health.[16] On the other hand, parents' perceptions of oral health strongly affected the occurrence of gingivitis in children, although parents' perceptions of their oral health often did not align with their actual condition, with 62.2% of fathers and 62.8% of mothers showing a discrepancy. Children whose fathers and mothers had poor oral health perceptions were nearly twice as likely to develop gingivitis, with higher gingivitis rates (42.6% and 42.4%, respectively) than those whose fathers and mothers had good oral health perceptions (27.8% and 27.3%, OR = 1.93 and 1.96, respectively). These findings suggest that parental attitudes toward oral health significantly influence children's oral health. This finding is consistent with the findings of studies from other countries that emphasize the role of parental oral health knowledge and behavior in shaping children's dental health.[17]

Sweet consumption was high, especially among fathers, with 86.7% frequently consuming sugary snacks and carbonated drinks, whereas fruit and vegetable intake was more balanced. Parental sweet consumption had no significant effect on children's gingivitis; however, fathers' consumption of fruits and vegetables was associated with a lower prevalence of gingivitis among children (35.3% vs. 39.3%, OR = 1.163). No significant association was found between parents' smoking habits and children's gingivitis. While parents' smoking habits were not significantly associated with children's gingivitis in this study, other studies have reported a connection between household smoking and children's gingival health.[18] This discrepancy highlights the need for further research, particularly long-term studies, to better understand the effects of secondhand smoke on children's oral health.

Table 2 shows the intergenerational relationship of oral health related behaviors between parents and their children.

Table 2. Intergenerational relationship of oral health related behavior between parents and their children

	Children's toothbrushing according to EBD		*p* value	OR (95% CI)
	No n(%)	Yes n(%)		
Father's toothbrushing according to EBD (n=2815)				
No	1805 (84.5)	332 (15.5)	< .001	1.739
Yes	460 (67.8)	218 (32.2)		(1.401-2.158)
Mother's toothbrushing according to EBD (n=3037)				
No			< .001	4.521
Yes	1767 (89.2)	214 (10.8)		(3.677-5.558)
	661 (62.6)	395 (37.4)		
	Children's perception of oral health problem		*p* value	OR (95% CI)
	Poor n(%)	Good n(%)		
Father's perception of oral health problem (n=2815)				
Poor	792 (45.2)	960 (54.8)	< .001	1.808
Good	316 (29.7)	747 (70.3)		(1.533-2.134)
Mother's perception of oral health problem (n=3037)				
Poor	829 (43.5)	1078 (56.5)	< .001	1.523
Good	355 (31.4)	775 (68.6)		(1.291-1.796)

	Children's sweet consumption frequency		*p* value	OR (95% CI)
	Often n(%)	Rarely n(%)		
Father's sweet consumption frequency (n=2815)				
Often	2248 (92.1)	306 (7.9)	< .001	1.866
Rarely	(81.6)	69 (18.4)		(1.353-2.572)
Mother's sweet consumption frequency (n=3037)				
Often	2233 (94.3)	524 (5.7)	< .001	3.971 (3.025-
Rarely	(78.4)	144 (21.6)		5.211)
	Children's healthy consumption frequency		*p* value	OR (95% CI)
	Often n(%)	Rarely n(%)		
Father's healthy consumption frequency (n=2815)				
Rarely	850 (70.5)	588 (29.5)	< .001	2.199
Often	(36.6)	1020 (63.4)		(1.828-2.644)
Mother's healthy consumption frequency (n=3037)				
Rarely	922 (83.5)	182 (16.5)	< .001	8.045
Often	642 (33.2)	1290 (66.8)		(6.562-9.862)
	Children's smoking status		*p* value	OR (95% CI)
	Active/passive smoker n(%)	Non smoker n(%)		
Father's smoking (n=1546)			< .001	3.290
Active/passive smoker	1014 (90.0)	113 (10.0)		(2.800-3.866)
Non smoker	227 (54.2)	192 (45.8)		
Mother's smoking (n=1642)			0.095	1.343
Active/passive smoker	40 (93.0)	3 (7.0)		(0.710-2.539)
Non smoker	1282 (80.2)	317 (19.8)		

Chi-square test

This study highlights the significant role of parents in shaping their children's oral health and lifestyle behaviors. A strong relationship was found between the toothbrushing habits of both fathers and mothers and those of their children, with mothers having a particularly pronounced influence. Children of mothers who brushed their teeth according to the evidence-based dentistry guidelines were far more likely to do the same. This highlights the critical role that mothers often play in supervising and teaching their children daily hygiene practices, which aligns with the findings of other studies showing that parental modeling strongly affects children's oral health behaviors.[19, 20]

Furthermore, this study revealed a significant relationship between parents' perceptions of oral health and their children's attitudes toward it. Parents with positive perceptions of oral health had children who were more likely to adopt similar views. These findings suggest that parents' knowledge and attitudes toward oral health can significantly influence their children's understanding and practices. Studies have shown that children are more likely to engage in positive oral hygiene behaviors when their parents have better oral health knowledge, reflecting the role of parents as role models and key influencers in shaping children's health-related attitudes and practices.[19, 21]

In terms of dietary habits, the study revealed a strong connection between parents' and children's consumption of both sweet and healthy foods. Children whose fathers and mothers avoided sweet foods such as sugary snacks were more likely to do the same, with mothers having a particularly strong influence. This emphasizes how parental eating habits shape children's food choices, suggesting that healthier food environments created by parents are likely to foster better dietary habits in children. The study also revealed that children whose parents frequently consumed fruits and vegetables were significantly more likely to do so, highlighting the strong influence of

parents' dietary patterns on their children's eating behaviors.[19, 22, 23]

Finally, the study revealed a significant association between fathers' smoking habits and their children's likelihood of being active or passive smokers. Children of fathers who smoked were more than three times more likely to adopt smoking behaviors. This finding supports the notion that fathers not only expose their children to secondhand smoke but also serve as role models who influence their children's smoking attitudes and behaviors. Interestingly, no significant relationship was found between mothers' smoking habits and their children's smoking behaviors, possibly because of the lower prevalence of smoking among mothers compared to fathers.[24, 25]

The choice of 3 years old as the baseline in this study on the relationship between gingivitis in parents and children reflects key oral health milestones, as most children have their primary teeth fully erupted by this age.[26] Parental oral health behaviors, mothers in particular, shape children's oral health status and practices, including proper oral hygiene routines, diet choices, regular dental check-ups, and the avoidance of harmful habits like smoking and excessive sugar consumption. Encouraging parental engagement in oral health promotion programs is crucial for better oral health outcomes and quality of life in future generations.[27] This aligns with the intergenerational life course model, in which genetic and environmental factors, along with family behaviors, impact health outcomes across generations.[12-13] However, the multifactorial nature of gingivitis means that not all family or individual factors are associated with its occurrence. This study also highlights the potential clustering effect within families, as shared environmental, behavioral, and genetic factors can lead to similar health outcomes in children. Statistical methods addressing this clustering are crucial for accurate analysis of the relationship between parental and child gingivitis. Additionally, contextual factors such as social, cultural, environmental, and economic conditions significantly influence family life and, consequently, oral health attitudes and behaviors. Recognizing parents as active facilitators in shaping children's oral health behaviors is essential, emphasizing the need for holistic family-centered interventions that consider broader contextual factors.[27]

This study, which used secondary data from the 2018 *Riskesdas,* has several limitations. The cross-sectional design captures data at only one point in time, making it unclear whether the observed gingivitis was caused by current or previous exposure. A life course approach is more accurate when using a cohort study; however, it requires tremendous research funding. Additionally, since the study used secondary data, the researchers could not control the type of data collected or how it was gathered, particularly for children under 15, where it is unclear whether the responses were directly from the child or provided by a parent or other household member. Another limitation of using *Riskesdas* data was the missing data for some variables. Missing data introduce statistical bias and reduce statistical power and sample representativeness. These effects distort findings, leading to invalid conclusions and compromised research credibility.[28, 29]

CONCLUSIONS

This study revealed a significant relationship between the occurrence of gingivitis in parents and children aged 3-14 years in Indonesia. Parents' toothbrushing habits were not significantly associated with their children's gingivitis; however, parents' perceptions of oral health were

strongly linked to children's gingivitis. Additionally, parental habits, particularly those related to toothbrushing, oral health problem perceptions, and sweet consumption, directly influenced children's oral habits. The findings align with the intergenerational life course model, highlighting that parents' oral health behaviors, perceptions, and consumption patterns significantly impact their children's oral health and habits. This study emphasizes the need for early preventive interventions and family-based health education approaches to reduce the prevalence of gingivitis in children. Further studies employing multivariate analysis are recommended to provide more comprehensive insights into the intergenerational impact on dental health and to explore life course health development theory in greater depth.

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