

Factors Affecting Oral Hygiene Behavior in 9-12-Year-Old Children Based on Data from Fars Birth Cohort Study

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Abstract

Background: Several factors may influence oral hygiene behavior, which is essential for oral health and well-being in children. This study aimed to investigate the factors that contribute to the oral hygiene behaviors in children, especially mothers' oral hygiene behaviors.

Methods: In this cross-sectional study, data from the fifth phase of Fars Birth Cohort Study were used. Our focus was on a group of 1143 children aged 9-12 years old in the year 2021. The demographic, socio-economic variables as well as oral hygiene behaviors of children and their mothers were assessed. The score for oral hygiene behavior was determined based on self-reported practices of brushing, flossing, and mouthwash, ranged between 0 and 3. The factors related to children's oral hygiene behavior were examined by logistic regression analysis.

Results: In this study, 345 (30.2%) of the children (50.3% females, average age 10.33 ± 0.48 years) did not brush their teeth, 1042 (91.2%) did not use dental floss, and 1083 (94.8%) did not use mouthwash. The mean score for oral hygiene behavior in children was 0.83 ± 0.67 . Mothers had a higher mean score of 1.42 ± 0.74 ($P < 0.001$). Several factors were found to be significantly associated with oral hygiene behavior in children, including higher scores for mothers' oral hygiene behavior ($OR = 2.18$, $P < 0.001$), living in the center of the province ($OR = 0.73$, $P = 0.04$), having insurance ($OR = 1.47$, $P = 0.03$), and having a government-employed mother ($OR = 0.52$, $P = 0.025$). Children with regular six-monthly or yearly visits had higher odds compared with those who visited the dentist only when a problem arose ($OR = 7.27$, $P = 0.009$, and $OR = 2.33$, $P = 0.01$, respectively).

Conclusion: The study revealed unacceptable oral hygiene behaviors in 9-12-year-old children, and showed the gap between oral hygiene behavior in mothers and children. The mother's role in promoting oral health and hygiene is crucial. Future research should consider mediating and confounding impacts of knowledge, attitudes, and practices related to oral hygiene.

Keywords: Oral hygiene, Child, Mothers, Iran, Cohort studies

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1. Introduction

Accumulation of plaque and poor oral hygiene have been identified as the contributing factors for both oral diseases (1) and systemic disorders. There are certain risk variables shared by both oral diseases and chronic diseases (2) that makes the promotion of oral hygiene a good target for public health policies. Although many educational and promotion oral health programs mainly focus on dietary recommendations, oral hygiene guidelines, and regular dental checkups, dental caries remains a challenge to control (3).

Optimum "oral hygiene behavior" (4), especially during childhood, can be preventive for oral diseases which are prolonged in nature and

accumulative for a lifetime. Although it has been demonstrated that in the absence of fluorides, oral hygiene has not been effective in the reduction of decaying teeth (5), this finding should not deter physicians from ignoring personal hygiene in the reduction of caries (6).

Personal oral hygiene behavior including tooth brush, dental floss, and mouthwash is seen as a pleasurable, practical, and cost-effective method of delivering fluoride on a regular basis in children. Childhood is a vulnerable period that influences people's long-term wellness, not just overall health but also their oral hygiene. Therefore, a good oral hygiene behavior among 9-12-year old children with mixed deciduous and permanent teeth is essential. Good oral hygiene is linked to decreased

risk of caries by 35%, especially among children in low-income and middle-income (LMIC) countries with limited access to dental services (7).

In Iran, the general state of oral health is unacceptable, especially among children. For example, only half of the students had good oral health index and oral health behaviors; brushing frequency, dental visit and flossing use were significantly associated with oral hygiene index (4). The percentage of decayed, missed and filled primary and permanent teeth among 8-15-year-olds was 62.8 and 78.6%, respectively; also, more than half of 12-year-old children had dental caries (5).

Identifying risk factors that can affect oral health and oral hygiene behaviors, could be beneficial to prevent the occurrence of unhealthy behaviors or to promote good behaviors. Several factors, including children's knowledge, attitudes, beliefs, goals, diet, and habits, can influence their oral hygiene behaviors. Other factors include socio-economic status, parents' education especially the mother, parents' occupation, living area, mothers' tooth brushing frequency, tooth brushing supervision, breastfeeding duration (8-10). According to research on oral hygiene behaviors and regular dental appointments, individuals at higher risk of oral diseases are less likely to visit a dentist on a regular basis (11). Also, the consumption of sweet drinks, water, powdered milk and mother's milk can influence oral hygiene behaviors, especially in the first years of life (12). It was revealed that the role of parents, particularly mothers, is critical in oral hygiene of children because they can shape their children's oral hygiene practices through modeling, educating, and monitoring. Oral health risk increases by poor oral hygiene and dietary practices of mothers and children; however, in case of health promotion efforts, they should include the whole family as a culturally suitable approach (13).

Oral hygiene behavior impacts children's care, health, education, and upbringing in terms of physical and mental health (14). However, there is still the need for more elaboration of contributing factors to their oral hygiene behavior in our context. Collectively, there is a need for updated understanding about children oral hygiene behavior and its contributing factors for public health intervention purposes. The present study aimed to investigate the factors, especially mothers' oral hygiene behaviors, that contribute to the

oral hygiene behaviors of 9-12-year-old children participated in Fars Birth Cohort Study.

2. Methods

This was a descriptive-analytical cross-sectional study based on the data collected in the fifth phase of Fars Birth Cohort Study. This cohort study began in 2010-2011, and its fifth follow-up phase was completed in 2021. The stratified random sampling method was used. The cohort study included 6921 women, in their 20th to 30th week of pregnancy, who had resided in Fars province for a minimum of six months before the interview. Several data on the health of children and their mothers were collected throughout the enrollment phase and five follow-up visits following birth (15). The children in the fifth phase were aged 9 to 12 years old in 2021. Due to the COVID-19 pandemic, data collection was done using the available sampling method in the form of absentee self-report through telephone interviews with mothers (16). The questions included the demographic characteristics of the mother and the child, socioeconomic status, and oral hygiene behavior of the mothers and their children (17). Due to the limitations of telephone questioning during the Covid-19 pandemic, oral hygiene behavior included toothbrushes, dental floss, and mouthwash (18, 19). The data were collected by health experts and entered into SPSS version 25.

The children whose mothers provided complete information and answered all the questions were included in the study. The exclusion criteria were mothers who declined to participate or did not answer the phone or had migrated, as well as samples with incomplete or missing data. The oral hygiene behavior of the mothers and the children were scored for statistical analysis, based on whether or not they performed the behaviors. The behaviors were tooth brushing, flossing, and mouthwash use, each with a score of 1 if performed, and 0 if not performed. The oral hygiene behavior score was calculated by adding the scores of the three behaviors, with a range of 0 to 3. Participants who did not perform any of the behaviors received a score of 0 and those who performed all the behaviors (regardless of frequency) received a score of 3 (20).

The factors related to the children's oral hygiene behavior score were examined by logistic

regression analysis in which the dependent variable was the children's oral hygiene behavior score. A score of 0 showed that the child does not perform any of the oral health behaviors and a score of 1 showed the performance of at least one of the oral health behaviors. The independent variables included age and birth order of the child, age of the mother, residence place, housing status, insurance status, education and employment status of mother, frequency of dental visit in last year, oral hygiene behavior of the mother, and oral health-related characteristics of the children. These characteristics were obtained from the previous phases of the cohort study. This included the history of consumption of powdered milk, water consumption at night, sweet liquids, and supplements when the children were two years old (21, 22). Sweet liquid consumption included fruit juices, sugary water, and sweetened syrups, and

oral supplementary consumption included AD vitamin, Ferrol (Iron), multi vitamin.

Both the number and percentage of variables that are categorical, mean and standard deviation of continuous variables were reported. The statistical significance of the link between the dependent and independent variables has been determined by P value, and the odds ratio with a 95% confidence interval was also reported. This study was reported following the STROBE standards for observational studies.

3. Results

3.1. Descriptive Data

The data for this study were collected from 1143 children and their mothers who participated in the

Table 1: Characteristics of the participants and the logistic regression results of the contributed variables of children's oral hygiene score

Variables		n (%)	P value	Odds ratio (95%CI)
Sex (Child)	Girl	575 (50.30)	-	1
	Boy	568 (49.70)	0.23	0.80 (0.64-1.11)
Resident Place	The center of the province	724 (63.3)	0.04	0.73 (0.53-0.99)
	Other cities in the province	419 (36.7)	-	1
Birth Rank	First	664 (58.1)	0.83	1.03 (0.75-1.41)
	Other	479 (41.9)	-	1
Housing	Non-owner	654 (57.2)	-	1
	The owner	489 (42.8)	0.11	0.79 (0.60-1.05)
Insurance Status (Child)	Insured	967 (84.6)	0.03	1.47 (1.02-2.13)
	Non-Insured	176 (15.4)	-	1
Educational Status (Mother)	Illiterate	9 (0.8)	-	1
	Diploma and below	752 (65.8)	0.11	0.17 (0.02-1.49)
	Academic	382 (34.4)	0.10	0.16 (0.01-1.46)
Employment Status (Mother)	Unemployed	944 (82.6)	-	1
	Government employee	78 (6.8)	0.02	0.52 (0.30-0.92)
	Private sector employee	70 (6.1)	0.49	0.81 (0.44-1.47)
	Freelance job	51 (4.5)	0.72	0.88 (0.45-1.73)
Dental Visit (Child)	Every 6 month	32 (2.8)	0.009	7.27 (1.64-32.24)
	Every Year	80 (7)	0.01	2.33 (1.21-4.48)
	When encountering a dental problem	1031 (90.2)	-	1
Sweet Liquid Consumption*	No	857 (75)	0.90	1.02 (0.67-1.57)
	Yes	286 (25)	-	1
Oral supplementary Consumption*	No	240 (21)	0.58	1.10 (0.78-1.55)
	Yes	903 (79)	-	1
Powdered milk*	No	770 (67.4)	0.72	1.05 (0.78-1.41)
	Yes	373 (32.6)	-	1
Water consumption at night*	No	754 (66)	-	1
	Yes	389 (34)	0.39	1.18 (0.80-1.74)
Quantitative Variables		Mean (SD)	P value	Odds ratio (95%CI)
Oral hygiene behavior of Mother		0.91 (0.28)	.001	2.18 (1.78-2.66)
Age of Mother		38.25 (4.86)	0.81	0.99 (0.96-1.02)
Age of Child		10.33(0.48)	0.61	1.08 (0.80-1.45)

SD: Standard Deviation; CI: Confident Interval; *Data from Stage 2&3 of cohort study

fifth phase of Fars Birth Cohort Study. The mean age of children was 10.33 ± 0.48 years, and 50.30% were female. Other characteristics of the study participants are detailed in Table 1. The children's oral hygiene behavior score was calculated by adding the scores of tooth brushing, flossing, and mouthwash use, with a range of 0 to 3. The mean score for the children was 0.83 ± 0.67 , and the mean score for the mothers was 1.42 ± 0.74 . The oral hygiene behaviors of the children and their mothers are presented in Table 2.

3.2. Logistic Regression Results

The factors related to the children's oral hygiene behavior score were examined by logistic regression analysis. The oral hygiene behavior score was significantly differed in children living in the center of the province compared with the children living in the center of the province ($OR=0.73$, $P=0.04$). The oral hygiene behavior score was differed significantly in children who were insured compared with children who were not insured ($OR=1.47$, $P=0.03$). The oral hygiene behavior score was significantly differed in children whose mothers were government employees compared with children whose mothers were unemployed ($OR=0.52$, $P=0.02$). The oral hygiene behavior score was significantly different in children who visited the dentist every 6 months or every year compared with children who visited the dentist only when they had a problem ($OR=7.27$, $P=0.009$, and $OR=2.33$, $P=0.01$, respectively). The oral hygiene behavior score was significantly different in children whose mothers had a higher oral hygiene behavior score as compared with children whose mothers had a lower oral hygiene behavior score ($OR=2.18$, $P<0.001$). Other variables such as sex, birth rank, mother's education, sweet liquid consumption, oral supplement consumption, milk powder consumption, water consumption at night, mother's age, and child's age did not show

a significant association with the children's oral hygiene behavior score (Table 1).

4. Discussion

The present study aimed to investigate the effect of factors, especially mothers' oral hygiene behaviors, that contribute to oral hygiene behaviors of 9-12-year-old children in Fars Birth Cohort Study. According to the study findings, self-reported oral hygiene of children in this study was not acceptable, and that the oral hygiene behavior score for mothers was significantly better than that of their children. The study also identified some demographic, socio-economic, and oral health-related factors that were associated with the children's oral hygiene behavior score. These factors included the place of residence, insurance status, mother's occupation, dental visit frequency, and mother's oral hygiene behavior score. The study also found no significant link between children's oral hygiene behavior at two years of age and their use of milk powder, sweetened beverages, and oral supplements. These findings had important implications for understanding the multi-level influences on oral hygiene behaviors for young children in this population.

The self-report oral hygiene of children in this study was not acceptable and warrants rigorous efforts by dental health policymakers. Only one-third of children in this study used tooth brush and less than 10 percent used dental floss and mouthwash. Previous results published in Iran also reported unacceptable oral health in children. In Iran, more than half of the 12-year-old children were reported to have decayed teeth. However, the relationship of dental caries and oral hygiene behavior should be further elaborated in this population (23).

The study finding revealed that the oral health and oral hygiene of mothers have a significant influence on that of their children, which is in line

Table 2: Oral hygiene behaviors of children and their mothers

Behavior		Score	Children n (%)	Mother n (%)
Brushing	No	0	345 (30.2)	128 (11.2)
	Yes	1	798 (69.8)	1015 (88.8)
Dental floss	No	0	1042 (91.2)	648 (56.7)
	Yes	1	101 (8.8)	495 (43.3)
Mouthwash	No	0	1083 (94.8)	1028 (89.9)
	Yes	1	60 (5.2)	115 (10.1)
Total Score (Mean \pm SD)		Range of 0-3	0.839 (0.679)	1.421 (0.747)

SD: Standard Deviation

with previous evidence (3). However, we found that the oral hygiene behavior score for mothers was significantly better than that of the children which needs to be further justified. This could be attributed to certain reasons; for instance, the need for parental supervision on oral hygiene behavior of their children at lower ages (24). Mothers may have a higher level of awareness and education regarding oral hygiene compared with their children. This knowledge gap may lead to differences in behavior. Children may not yet have the maturity to understand the importance of oral hygiene or may lack the fine motor skills needed for effective brushing and flossing (25). Peers or societal factors may have an impact on children's oral hygiene practices (26). Mothers, as adults, are likely to have established daily routines, making it easier for them to incorporate oral hygiene practices. Children, on the other hand, may still be in the process of developing consistent routines (27). For an understanding of the relative influence of these factors, further research should bridge the gap in oral hygiene behavior between mothers and their children. Education, support, and creating a conducive environment for children to adopt healthy oral habits are essential components of narrowing this division (28).

The study also demonstrated that children living in the center of the province had a lower oral hygiene behavior score than those living in other cities, which could be related to differences in the availability and affordability of dental care services (29), exposure to unhealthy foods and drinks, and awareness and knowledge of oral hygiene in urban and rural areas (30). These findings are similar to some studies that report the effect of residence on oral hygiene behavior (31, 32).

Insured children and children of government-employed mothers had higher scores for oral hygiene behavior than uninsured children and children of jobless mothers. These findings support previous data that insurance, occupation, and education are effective variables in preserving oral health (32-34).

The study results also showed that children who visited the dentist regularly had a higher score for oral hygiene behavior than those who did not. This finding is supported by other studies that showed the benefits of regular dental visits for children's oral health (32, 35). Regular dental visits can help prevent and treat oral diseases, provide oral hygiene education and guidance, and reinforce

positive oral health behaviors (36). Therefore, it is recommended to implement policies that encourage periodic dental examinations for children from birth to adulthood. This can benefit the health of the population, especially children, and reduce the costs for families and governments.

In addition, no significant link was identified between children's oral hygiene behavior and their usage of milk powder, sweetened beverages, and oral supplements in the first two years of life. This contradicts previous findings, as these factors are known to increase the incidence of dental caries and oral disorders (37). However, the effect of these factors was probably missed by the self-reported oral hygiene behavior score, which only took into account whether or not children did brushing, flossing, and mouthwash use behaviors. Due to a lack of information, the quality of behaviors and oral and dental examinations of the mother and child by a dentist were not addressed in the analysis. To provide more information, future research should analyze daily eating habits and schedules of urban and rural children, including caries-causing sugars, as well as their oral and dental health status (38).

A small portion of the mothers in this study indicated that they use all three practices to maintain their oral hygiene. In addition, parents seek dental care to their children, only in case of oral or dental problems so that only about 10% had regular six-monthly or annual visits. The distribution and characteristics of the population were closely comparable to those found in other studies (31, 39).

4.1. Limitations

Recall bias, social desirability bias, or measurement error can arise when individuals provide information about their oral health behaviors through phone surveys. The quality of performing the behaviors and the oral and dental examination of the mother and the child by a dentist could not be considered in the analysis (40). Children's oral hygiene behavior is possibly underestimated, particularly when mothers mention oral hygiene practices. The use of cross-sectional data to investigate the impact of variables on oral hygiene behaviors may make it difficult to establish causal linkages and time sequences. Future research should control and evaluate the mediating and confounding impacts of other variables, such as knowledge, attitudes, beliefs, and

practices related to oral hygiene. The intricacy and diversity of oral hygiene habits may be captured using logistic regression to examine the impact of factors on oral hygiene practices. Mother and child oral hygiene practices may not be autonomous and may have mutually reinforcing effects. Future research may greatly benefit from using multilevel or structural equation modeling to consider the layered and dynamic character of oral hygiene activities.

5. Conclusion

The study revealed unacceptable oral hygiene behavior among 9-12-year-old children and showed the gap between oral hygiene behavior in mothers and children. The mother's role in promoting oral health and hygiene is crucial. Future research should consider mediating and confounding impacts of knowledge, attitudes, beliefs, and practices related to oral hygiene.

Ethical Approval

The Ethics Review Board of Shiraz University of Medical Sciences approved the present study with the code of IR.SUMS.REC.1402.415.

Authors' Contribution

Mohsen Sharif Zadeh Ardakani: Substantial contributions to the conception or design of the work, acquisition, analysis, or interpretation of data for the work, drafting the manuscript and revising it critically for important intellectual content. Sulmaz Ghahramani: Substantial contributions to the conception or design of the work, acquisition, analysis, or interpretation of data for the work, drafting the manuscript and revising it critically for important intellectual content. Seyed Taghi Heydari: Acquisition, analysis, or interpretation of data for the work, drafting the manuscript and revising it critically for important intellectual content. Maryam Bakhtiar: Substantial contributions to the conception or design of the work, acquisition, analysis, or interpretation of data for the work, drafting the manuscript and revising it critically for important intellectual content. Parissa Sadat Ghoreishi: Acquisition, analysis, or interpretation of data for the work, drafting the manuscript and revising it critically for important intellectual content. Kamran Bagheri Lankarani: Substantial contributions to the conception or

design of the work, drafting the manuscript and revising it critically for important intellectual content. All authors have read and approved the final manuscript and agree to be accountable for all aspects of the work, such that the questions related to the accuracy or integrity of any part of the work.

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