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The Impact of Maternal Oral Health Knowledge and Behavior on Children's Oral Health Status: A Cross-Sectional Study

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Abstract:

Objective(s): The extent to which mothers' oral health, knowledge, and attitudes influence their children's oral health remains a subject of debate. Many researchers consider parents' inadequate knowledge and attitudes regarding their children's oral health to be responsible for poor oral health outcomes. This study investigated the level of knowledge regarding the prevention of dental caries and its impact on oral health-related behaviors among mothers. **Methods:** In this cross-sectional study, 196 mother-child pairs were selected, with children aged 5 to 12 years seeking dental treatment. A questionnaire was provided to the mothers, including demographic information, the mothers' oral health behaviors, the children's oral health behaviors, and the mothers' knowledge of methods for preventing dental caries. In addition, an oral health examination was conducted to measure the child's DMFT/dmft index. Quantitative variables were described using central tendency and distribution measures, while qualitative variables were reported using frequency percentages. T-test/Mann-Whitney were used to compare quantitative variables. For the comparison of qualitative variables, the Chi-square test was applied at $p<0.05$. **Results:** There was a significant relationship between the oral health behaviors of mothers and those of their children. Although mothers' knowledge of caries prevention was moderate, both mothers' and children's behaviors were unsatisfactory. No significant relationships were found between the mothers' knowledge and their oral health behaviors, their children's oral health behaviors, or the children's DMFT/dmft scores. **Conclusion:** Educational interventions should focus on improving mothers' oral health behaviors to promote oral health in children. Further studies are needed to evaluate the relationship between knowledge and its impact on oral health behaviors.

Keywords: Mothers; Children; Dental Caries; Prevention; Behavior

Introduction

The health and hygiene of individuals are primary concerns for physicians and dentists. As oral health is a critical component of overall health and children are a vulnerable group, their oral hygiene is pivotal.[1] Dental caries is a global health issue affecting millions of children with decay in their primary teeth.[2] Despite significant progress in recent years, such as the utilization of fluoride, increased efforts in enhancing oral health, extensive health education, and advances in the treatment of tooth caries, dental caries remains one of the most prevalent chronic diseases among children.[3] Tooth caries affect children and adults worldwide, impacting individuals across all socioeconomic levels, from the poor to the wealthy.[4]

Unfortunately, many children suffer from tooth caries from a very young age, even before they reach twelve.[5] This can be primarily attributed to socioeconomic factors. On an individual level, factors such as age, racial and ethnic background, educational attainment, and gender play important roles. Behaviors related to individual oral health, as well as their outcomes, are influenced by factors at the individual, family, and societal levels.[6] Childhood tooth caries often begin a detrimental cycle of poor oral hygiene. An unhealthy diet and inadequate oral hygiene in the first two years of life are commonly associated with early childhood caries (ECC).[7]

Since behavior is linked to the awareness of various health aspects, including oral health [8], parents' knowledge and attitudes about oral health can significantly influence both their own and their children's oral health.[9] Specifically, parents' appropriate knowledge and attitude towards oral health can positively impact their children's oral health, particularly in the early years of life.[10, 11] Mothers' knowledge, behaviors, and beliefs about oral hygiene are closely linked to ECC. Factors such as poor diet and oral hygiene practices, lack of access to specialized dental care, and misconceptions—such as the belief that children and their primary teeth are immune to tooth caries—play a significant role.[10] Given the crucial role families,

particularly mothers, play in shaping children's oral health, and the persistent controversy in this area, this study examined mothers' knowledge of preventive measures for childhood tooth decay.

Methods

The current study involved 196 mothers and their children aged 5 to 12 who sought dental treatment at the Department of Pediatric Dentistry, International Campus, Tehran University of Medical Sciences.

The sample size was determined using the formula for estimating a single proportion. With an alpha level (α) of 0.05, a prevalence estimate (p) of 5%, and a margin of error (d) of 7%, the minimum required sample size was calculated to be 196 using Minitab software.[6]

The study was conducted under the ethical code IR.TUMS.VCR.REC.1395.1219 and ensured that the questionnaires were anonymous. This allowed all eligible participants to participate without disclosing their identities, thereby adhering to ethical standards of confidentiality and privacy.

The data collection tools included a questionnaire divided into six parts. The first part focused on the research data and obtaining participants' consent and satisfaction with their involvement in the study. The second part of the questionnaire asked for demographic information, including the child's age, gender, the mother's age, and the educational levels of both parents. The third part consisted of eight questions assessing the mothers' knowledge about tooth caries prevention, using a five-point Likert scale ranging from "completely agree" to "completely disagree."

The fourth and fifth sections included multiple-choice questions to assess the mother's oral hygiene practices. These questions focused on several key areas: the number of times teeth are brushed each day, the use of fluoride toothpaste, the daily snack consumption, the frequency of dental floss usage, the regularity of dental visits, and smoking habits. Both mothers and children completed these questions separately.

The sixth part of the questionnaire assessed the children's dmft/DMFT index, based on WHO criteria. This assessment was conducted through a dental examination using mirrors and explorers under the dental unit's lighting.

After collecting the data, the responses were scored and entered into SPSS version 26 software for statistical analysis using various tests. The knowledge questions were scored on a Likert scale [12] from one (completely disagree) to five (completely agree), resulting in an expected score range of 8 to 40. The criteria for assessing oral health behaviors were derived from the Folayan et al. study.[6] Correct oral health behaviors were evaluated using a validated and reliable questionnaire established in previous studies.[6, 13] These behaviors included brushing teeth at least once daily, regularly using fluoride toothpaste, consuming sweet snacks less than once daily, using dental floss at least once daily, and visiting the dentist at least once yearly. Additionally, for mothers, not smoking was considered a correct oral health behavior. Each correct answer was awarded a score of 5, while incorrect answers received a score of 1. Thus, the minimum possible score for mothers' oral hygiene behavior was 6, with a maximum of 30. For children, the score range was between 5 and 25.

Quantitative variables were described using central tendency and distribution measures, while qualitative variables were reported using frequency percentages. Parametric or non-parametric tests (equivalent to T-test/Mann-Whitney) were used to compare quantitative variables, depending on the distribution of the variables. For the comparison of qualitative variables, the Chi-square test was applied at $p<0.05$.

Results

Demographic data

Among the 196 participants, 102 mothers (52%) had sons, and 94 (48%) had daughters. The average age of the mothers was 33 years (SD = 5.07), and the average age of the fathers was 37 years (SD = 5.78). The oldest parent was 51 years old, and the youngest was 25. The youngest child was 5 years old, and the oldest was 9.50 years old (SD = 23.90 months). Most participants (149 individuals) reported being in an average economic situation, and the most common educational level for both mothers and fathers was a high school diploma.

Table 1 presents the frequency of mothers' responses to the questions related to knowledge of dental caries prevention methods.

The findings suggested that mothers' knowledge was relatively desirable regarding the effects of fluoride toothpaste use, the more significant impact of the frequency of eating sweets on tooth caries compared to the total amount of sweets consumed, the importance of brushing with fluoridated toothpaste twice a day, and the significance of regular dental visits in preventing tooth cavities. However, in other cases, their knowledge was unsatisfactory. The average knowledge score for mothers was 21.52 (SD = 7.8), with a minimum score of 8 and a maximum score of 40.

Oral health behaviors

Table 2 presents the oral health behaviors of mothers and children separately. For mothers, the minimum score was 9, the maximum score was 20, and the average score was 15.07 (SD = 12.56). For children, the scores ranged from a minimum of 6 to a maximum of 20, with an average score of 12.40 (SD = 22.63). After analyzing the three variables

using the Pearson correlation coefficient, it was found that there was no significant relationship between the level of mothers' knowledge and the variables of mothers' oral hygiene behavior (p= 0.14) and children's hygiene behavior (p = 0.39). However, a significant relationship was observed between mothers' oral hygiene behavior and children's hygiene behavior, with a correlation coefficient of 0.4.

Table 3 demonstrates DMFT & dmft conditions and their components separately in examined children. Additionally, no significant relationship (p = 0.67) was found between the mothers' oral hygiene knowledge or behavior or children's hygiene behavior and the dmft/DMFT scores.

Table 1- Frequency of mothers' answers (N=196) to the questions related to knowledge of dental caries prevention ways

	Completely disagree	Disagree	I don't know	Agree	Completely agree
Adding fluoride to drinking water is an effective, reliable, and efficient way to prevent tooth caries	12(6.1%)	28(14.3%)	90(45.9%)	45(23%)	21(10.7%)
Use of fluoride toothpaste is an effective, reliable, and efficient way to prevent creating tooth cavities	2(1%)	9(4.6%)	35(17.9%)	97(49.5%)	53(27%)
Effect of the number of eating sweets in tooth caries is more than the total amount of sweets eaten	3(1.5%)	8(4.1%)	29(14.8%)	88(44.9%)	68(34.7%)
Fissure sealant is an effective factor in preventing caries in fissures and pits in newly erupted permanent molar teeth	1(0.5%)	4(2%)	119(60.7%)	39(19.9%)	33(16.8%)
Use of less water for washing the remained toothpaste in the mouth after tooth brushing increases the effect of fluoride	18(9.2%)	53(27%)	51(26%)	52(26.5%)	22(11.2%)
Importance of using fluoride toothpaste in tooth caries is more than the brushing method	16(8.2%)	76(38.8%)	34(17.3%)	50(25.5%)	20(10.2%)
Brushing with fluoride toothpaste twice a day is an effective way of preventing tooth cavities	4(2%)	14(7.1%)	23(11.7%)	92(46.9%)	63(32.1%)
Regular dental visits are important in preventing tooth cavities	2(1%)	2(1%)	11(5.6%)	57(29.1%)	124(63.3%)

Table 2- self-reported behaviours of mothers and children separately (N=196)

Oral health behaviour	Children N=196	Mothers N=196
He /she brushes his / her tooth more than once a day	20(10.2%)	48(24.5%)
He /she always or usually uses fluoride toothpaste	75(38.3%)	75(38.3%)
He /she uses sweets less than once a day	65(33.2%)	101(51.5%)
He /she uses tooth floss once a day	25(12.7%)	46(23.5%)
He /she visited a dentist in the last 12 months	99(50.5%)	82(41.8%)
He /she has not smoked recently		186(94.9%)

Table 3- DMFT & dmft conditions and their components separately in examined children (N=196)

Variable	Mean	Standard deviation	Maximum	Minimum
Number of primary decayed (d) teeth	3.43	3.04	17	0
Number of primary missing (m) teeth	0.21	0.60	4	0
Number of primary filled (f) teeth	1.04	1.59	10	0
dmft	4.68	3.01	17	0
Number of permanent decayed (D) teeth	0.20	0.69	4	0
Number of permanent Missing (M) teeth	0.00	0.00	0	0
Number of permanent Filled (F) teeth	0.03	0.24	3	0
DMFT	0.23	0.76	5	0

Discussion

Demographic factors

This study found no significant relationship between demographic factors, such as parents' age, educational level, and family economic situation, and the oral hygiene levels of their children. Sehrawat et al. [14] assessed the mothers'

attitudes and knowledge about oral hygiene using a questionnaire. They reported a significant relationship between their age, educational level, and hygiene knowledge. Paula et al. concluded that the mother's level of education and family relationships serve as protective factors against dental caries in 5-year-old children, aligning with behavioral and biological factors. On the contrary, in this study, no significant relationship was found between maternal education and other variables.[15] Prieto-Regueiro et al. found out that lower socioeconomic and cultural level and foreign origin were linked to poorer oral health in preschool children.[16]

No study has shown a significant relationship between parents' age and children's oral hygiene. Still, several studies have concluded that parents' knowledge is significantly related to their children's oral health.[6, 17]

The lack of a significant relationship between these demographic factors and children's hygiene levels in the present study may be attributed to the homogeneity of the participants, particularly in terms of their cultural and economic status.

Mother's level of oral health knowledge

Almoudi et al. [18] examined maternal knowledge about preventing children's tooth caries and oral hygiene using a questionnaire and face-to-face interviews. They observed that less than half of the mothers had adequate knowledge about oral hygiene. In another study conducted by Battepati et al. [11] on nurses who were mothers, the overall mean level of maternal knowledge was low. Similarly, another study by Thomas et al. [19] reported low mean level of mothers' knowledge. Besides, Nourijelyani et al.[17] showed that mothers' knowledge was below average.

Furthermore, Folayan et al. [6] reported that most mothers had an average level of oral health knowledge. Comparably, Moallemi et al.'s [13] study showed that the mothers' oral hygiene knowledge was average.

Generally, the level of mothers' hygiene knowledge depends on various factors such as educational level, dental experience, culture, and geography, contributing to differences across different societies and cultures.[3, 17]

Relationship between maternal oral health knowledge and their own or their children's oral health

According to a study by Moallemi et al., the mother's oral health knowledge plays a crucial role in the oral health of her newborn child, and proper oral hygiene in the early years is associated with a reduced risk of tooth caries throughout life.[13]

In the present study, there was no significant relationship between the mothers' knowledge of tooth caries prevention methods and their own or their children's oral health behaviors. However, Thomas et al. [19] study reported that mothers with sufficient knowledge about health behaviors had a generally low level of oral hygiene behavior.

We also examined the influence of mothers' oral health knowledge on their children's hygiene levels and behaviors. The results showed no significant relationship between the level of hygiene knowledge among mothers and their children's oral hygiene and health. This finding is consistent with the study conducted by Folayan et al., which also found no significant relationship between parents' hygiene knowledge and their children's hygiene behaviors.[6] Additionally, Shetty et al. reported that although children's hygiene behavior improved with increased maternal knowledge, there is no significant relationship among them.[20]

On the contrary, Nourijelyani et al. and Moallemi et al. found a considerable relationship between mothers' knowledge and their children's oral health that can improve children's oral health.[13, 17] In parallel with the abovementioned study, Sehrawat et al. [14] found that children whose mothers had low hygiene knowledge exhibited significantly lower hygiene levels.

In the present study, which was conducted in a single clinic within one city zone, most participants had similar cultural backgrounds and hygiene behaviors. This uniformity may have contributed to the absence of notable differences observed. Knowledge and human behavior are closely interconnected. Various studies suggest that hygiene behaviors improve in societies with higher levels of general knowledge.[6, 13, 17]

Level of maternal oral hygiene

In the present study, we also aimed to assess mothers' oral health conditions. The results showed that mothers' oral health behaviors were average. Aside from a few participants who smoked, no specific behavioral patterns were observed. However, Almoudi et al. [18] observed a low level of oral hygiene among the mothers, but Shetty et al. [20] reported that the mothers had suitable oral hygiene behavior and knowledge.

Relationship between maternal oral hygiene and their children's oral hygiene

Folayan et al. [6] found a strong relationship between mothers' oral health and that of their children. It was also concluded that children with higher hygiene knowledge tend to exhibit better health behaviors.

dmft/DMFT

Finally, we examined the relationship between mothers' knowledge, oral health behavior, and their children's verbal behavior and dmft/DMFT scores. No significant relationship was found between these variables.

A similar study by Manchanda et al. [21] showed a significant and inverse relationship between dmft/DMFT scores and mothers' oral health knowledge. However, according to the Folayan et al. [6] study, no significant relationship was found between mothers' oral hygiene knowledge and dmft/DMFT scores.

The lack of a relationship between children's oral hygiene behavior and their dmft/DMFT scores in the current study may be because there were not many children with very poor or excellent oral hygiene behaviors, and most participants were from the same region. The absence of a significant relationship between oral hygiene behavior and dmft/DMFT does not imply that no relationship exists; instead, it suggests that, in this particular study, the similarity in hygiene behaviors among the participants was so pronounced that no correlation with dmft/DMFT could be detected, even after adjusting for age and gender, children's hygiene behavior.

Conclusion

This study found no significant relationship between demographic variables and children's oral health, hygiene, or hygiene behaviors. Additionally, the level of oral hygiene knowledge in the studied population was average. No significant relationship was observed between mothers' hygiene knowledge and their children's hygiene behavior, except a direct relationship between mothers' hygiene behavior and their children's behavior.
Given the direct relationship between mothers' oral health behavior and their children's behavior, this study underscored the potential to positively influence children's behavior through educating mothers and modifying their behaviors.

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Ethical Approval Code: IR.TUMS.VCR.REC.1395.1219

Informed Consent Statement: The first part of the questionnaire focused on obtaining the participants' consent and satisfaction with their involvement in the study.

Data Availability Statement: The datasets generated during the current study are available from the corresponding author on reasonable request.

Using AI: ChatGPT (OpenAI', San Francisco, CA,USA) was used exclusively for language editing of the manuscript under the direct supervision of the authors. All intellectual and scientific content was prepared by the authors themselves.

Conflict of Interest: Authors declare no conflict of interest.

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