

Mothers' Knowledge and Practice towards the Effects of Iron Supplementation on Tooth Staining and Dental Caries in Yazd, Iran

Iman Parisay¹, Sara Arastoo², Aliasghar Solaymani³, Alaleh Toloee⁴, Mahsa Ahmadi⁵

¹ Associate Professor of Paediatric Dentistry, Dental Materials Research Center, Mashhad University of Medical Sciences, Mashhad, Iran

² Pedodontist, Private Practice, Ahvaz, Iran

³ Assistant Professor of Paediatric Dentistry, Faculty of Dentistry, Shahid Beheshti University of Medical Sciences, Tehran, Iran

⁴ Post graduate Student of Paediatric Dentistry, Faculty of Dentistry, Tehran University of Medical Sciences, Tehran, Iran

⁵ Post graduate Student of periodontology, Faculty of Dentistry, Islamic Azad University of Isfahan (Khorasgan branch), Isfahan, Iran

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Abstract

Aims: Iron supplementation in children under 5 years of age is recommended on the basis of anaemia prevention. This study aims to assess the mother's knowledge and practice towards the effects of iron supplementation on dental caries and staining in children aged 6 months to 2 years in Yazd, Iran. **Methods:** A randomized cross-sectional study was conducted on 403 mothers of children (aged 6 months to 2 years) who referred to healthcare centers in Yazd during 2011. The mothers' knowledge and practice levels were assessed using a questionnaire, and the results were categorized into sufficient or insufficient. The Chi-square test was used to analyze the data. **Results:** According to the results, 241 (59.8%), and 273 (67.7%) mothers obtained sufficient levels of knowledge, and practice, respectively. Moreover, mothers' educational levels had a statistically significant relationship with their knowledge regarding iron supplementation ($P < 0.001$). Additionally, the mother's practice toward iron supplementation correlated significantly with mothers' educational level ($P < 0.001$) and occupational status ($P = 0.018$), as well as the birth order of the child ($P < 0.001$). **Conclusion:** More than half of the mothers had sufficient knowledge and practice towards the effects of iron supplementation on dental caries and staining

Keywords: Dental caries, Dental staining, Iron deficiency, Knowledge, Practice

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Introduction

Iron deficiency is the most widely distributed state of nutrient deficiency that affects over 2 billion people worldwide (1, 2). Approximately, 50% of the anaemia cases are caused by iron deficiency (3, 4). Iron-deficiency anaemia is a major problem in Iran (2). According to the World Health Organization report in 2005, the prevalence of anaemia was in the moderate category in Iran, which indicated that 33% and 35% of the preschool children and non-pregnant women, respectively, had hemoglobin concentrations below their reference values (5). According to a study conducted by Nazari, the prevalence of anaemia among Iranian children under 6 years of age was 18.2% (6). In some cases, different food supplements with iron salts mitigate this deficiency (7). On the other hand, iron supplementation is recommended for children under the age of 5 years on the basis of anaemia prevention (8). Iron supplementation in toddlers generally come in liquid form since children at this age

are usually unable to swallow tablets. In addition to its undesirable taste, one of the main problems in administering iron is the teeth discoloration. Moreover, staining is more obvious on hypo mineralized and decalcified areas of the tooth (9). Extrinsic stains are located on the outer surface of the tooth structure after eruption through the gums into the mouth that is caused by topical or extrinsic agents. The aetiology of extrinsic tooth staining can be divided into two categories. Firstly, the compounds that are incorporated into the pellicle and produce a stain due to their basic colour. The second aetiology is due to a chemical interaction on the tooth surface. Extrinsic discoloration that has been associated with iron salts in liquid form is believed to result from a chemical interaction between hydrogen sulphide producing micro-flora and iron (10). The utilization of iron supplements in the right way can reduce tooth discoloration to a great extent. Parents occasionally come up with the wrong idea that iron supplements cause dental caries in children, thereby refusing its use. In contrast to public belief, several studies conducted on humans and animals have shown the cariostatic properties of iron (9, 11). Iron protective mechanisms are not completely clear, and several possible explanations have been suggested so far (9). Pecharki et al. (12) reported that iron might reduce the cariogenic potential of sucrose in situ, and the effects seemed to be related to the reduction of *Streptococcus mutans* in the dental plaque. In the same line, Miguel et al. in a study that was carried out on desalivated rats found that iron added to sucrose alone or in combination with other ions had a great effect on the reduction of the cariogenic potential of the sugar. In addition, Devulapalle and Mooser (14) have shown that iron ions are strong inhibitors of the glucose transferase enzyme. It has been shown recently that iron can inhibit acid demineralization by influencing mineral dissolution directly (1). The prevalence of dental caries is high in countries, where iron deficiency is evident, although the two factors are not necessarily directly related (1, 15). Therefore, this study aimed to evaluate the mother's knowledge and practice regarding the effects of iron supplementation on tooth staining and dental caries in Iranian children aged 6 months to 2 years.

Materials and Methods

This cross-sectional study was conducted in Yazd, which has an area of 131,551 km² and is situated at an oasis where the Dasht-e Kavir and Dasht-e Lut deserts meet. This study was performed on the mothers of children

(aged 6 months to 2 years) who referred to healthcare centers in Yazd, Iran, during 2011. In order to determine an appropriate sample size to achieve an adequate power of 95% and a defined significance level of 5%, the number of mothers was estimated at 383. Regarding the sample attrition, with 20 more participants, the final sample size was determined at 403. Multistage sampling was adopted for the selection of mothers. In the first stage, out of 18 healthcare centers in Yazd, Iran, 10 ones were randomly selected and included in this study. In the second stage, written informed consent to participate in the study was obtained from all mothers who referred to the selected centers (n=403). In order to evaluate parental knowledge and practice regarding the effect of iron supplementation on tooth staining and dental caries, the mothers were asked to complete the questionnaires in a quiet room at the healthcare centers. The questionnaire consists of three sections. Part one includes demographic characteristics that cover information, such as mothers' knowledge, educational level, occupational status and also the child's age, gender, and birth order. Part two and three consist of 8 and 6 questions, respectively, regarding parental knowledge and practice toward the effects of iron supplementation on dental caries and staining in children. The pediatric physicians and pedodontists were requested to review the questionnaire and state their comments regarding the validity of the questionnaire. Accordingly, their suggestions were assessed and the necessary revisions were considered. Afterward, the questionnaire was pretested on five mothers to ensure that the questions measure what they were intended to assess. Cronbach's alpha was utilized to estimate the reliability of the questionnaire. Out of a group of 20 mothers, Cronbach's alpha of the knowledge and practice were obtained at 0.74 and 0.89, respectively, which reflected a good internal consistency. Regarding the scoring, the correct and incorrect answers scored 1 and 0, respectively. Subsequently, the percentage of the correct answers was calculated and categorized as sufficient (>50%) and insufficient (<50%).

Statistical analysis

The data were analyzed using descriptive-analytical tests and the Chi-square test. A P-value less than 0.05 was considered statistically significant.

Results

In total, 403 mothers participated in this study. The mean age of the mothers was 27.3±5.1 years. Table I summarizes the demographic characteristics of the mothers.

Table I. Demographic characteristics of the mothers

	Variables	N (%)
<i>Mothers' level of education</i>	Elementary	57 (14.1)
	High school	207 (51.4)
	Academic education	139 (34.5)
<i>Occupational status</i>	Employed	133 (30.9)
	Unemployed	270 (69.1)

Mothers' level of knowledge

The distribution of mothers' answers regarding their knowledge of iron supplementation is presented in Table II. The mothers obtained the highest rate of correct answers regarding the proper dose of iron supplementation (86.4%). On the other hand, the lowest rate was related to the questions about brushing the child's teeth before iron supplementation (24.2%). Furthermore, the relationship of mothers' knowledge,

their educational level, occupational status, birth order of the child, and the child's gender was evaluated in this study. According to the results, only the educational level of mothers had a statistically significant association with their knowledge regarding iron supplementation ($P < 0.001$). It, therefore, indicated that the higher the education, the more the knowledge level of mothers. The results obtained from the evaluation of mothers' answers to the questionnaire revealed that 241 (59.8%) and 162 (40.2%) mothers had sufficient and insufficient knowledge, respectively.

Table II. Distribution of mothers' answers regarding their knowledge of iron supplementation in their children

Questions	Correct answers	
	N	%
What is the best time for starting iron supplementation in children?	348	86.4
How long the iron supplementation should be continued?	309	76.9
What are the main reasons for administering iron supplements to children?	259	64.3
Does iron supplement cause tooth staining?	344	85.6
Does iron supplement cause tooth decay?	197	49.2
Is it necessary to clean the child's teeth before using the supplement?	88	24.2
Does mixing the orange juice with the supplement decrease staining?	144	41.8
Can dropping of the supplement at the back of the mouth decrease staining?	246	71.5

The distribution of mothers' answers regarding their practice of iron supplementation is shown in Table III. The mothers obtained the highest rate of correct answers in terms of the proper time of starting iron supplementation (86.9%). On the other hand, the lowest rate was related to questions about cleaning the child's teeth prior to iron supplementation (21.3%). Mothers' practice toward iron supplement use correlated significantly with mothers' educational level ($P < 0.001$),

occupational status ($P = 0.018$), and birth order of the child ($P < 0.001$). According to the results obtained from the evaluation of mothers' answers to the questionnaire, it was revealed that 273 (67.7%) and 130 (32.3%) mothers had sufficient and insufficient levels of practice regarding iron supplementation. The relationship between mothers' knowledge and practice towards iron supplementation is presented in Table IV. According to the results, the higher the mothers' level of knowledge, the more improved their level of practice.

Table III. Distribution of mothers' answers regarding their practice of iron supplementation in their children

Questions	Correct answers	
	N	%
The proper time to start iron supplementation in a child.	261	72.9
Do you clean the child's teeth prior to iron supplementation?	81	21.3
Do you clean the child's teeth after iron supplementation?	241	63.1
Do you drop the supplement at the back of your child's mouth?	271	70.8
When did you start iron supplementation?	331	86.9
Do you dilute the iron supplement in juice or water?	128	33.4

Table IV. Relationship between mothers' knowledge and practice regarding iron supplementation in children

Practice	Sufficient	Insufficient	P-value
Knowledge	N (%)	N (%)	
Yes	190 (78.9)	51 (21.1)	< 0.001 *
No	83 (51.2)	79 (48.8)	Chi-square test

*Significantly different

Discussion

This study aimed to investigate the mothers' level of knowledge and practice towards the effects of iron supplementation on tooth staining and dental caries. Tooth staining is caused by iron supplements, and the misunderstanding regarding the relationship between the iron supplement and dental caries is among the most critical problems leading to avoiding iron supplementation in children by their parents. In this

study, 241 (59.8%) mothers had sufficient knowledge about iron supplements. Moreover, 76.9% of the mothers knew the age range that the iron supplements should be used.

This finding shows significant improvement, compared to the rate of 41.75% reported by Karimi et al. in 2002. They assessed mothers' level of knowledge regarding their child's nutrition in the first 2 years after birth in Yazd, Iran (16). According to the results of a study conducted in Mashhad, 99.5% of the parents answered

this question correctly (9). Moreover, less than half (49.2%) of the mothers participating in this study had knowledge about the role of the iron supplementation on tooth decay, which indicates the need for more public education in this area. Moreover, mothers' educational level had a statistically significant correlation with their knowledge regarding iron supplementation, and mothers with higher levels of education had more knowledge. Keyghobadi et al. (17) investigated the effect of mother training on the nutritional status of children and declared that the literacy level was an important factor in knowledge level before and after training. However, Talebi et al. (9) reported that mothers' educational level was not statistically correlated with their knowledge. In contrast, there was a statistically significant correlation between fathers' educational level and their knowledge. In the present study, 273 (67.7%) mothers had sufficient practice toward iron supplementation. Diluting the iron supplement in a couple of ounces of juice or water can help prevent stains from occurring. Since vitamin C facilitates iron absorption, adding the supplement to orange juice can be more beneficial. Only 31.8% of the mothers in the current study did so, compared to 87.3% of those participating in a study performed by Talebi et al. (9). As an additional preventive step, reducing contact of the diluted supplement mixture with the front teeth by having the toddler use a straw or sippy cup can also be helpful. Totally, 67.2% and 93.2% of the mothers in this study and the study conducted by Talebi et al. practiced this method, respectively (9). Tooth brushing twice a day, especially after administering iron supplements, will help to alleviate tooth discoloration. In this study, 59.8% of the mothers did so, compared to 24.5% of the parents in a study conducted by Talebi et al.(9). In this study, mothers' educational level and occupational status had a statistically significant association with their practice

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regarding iron supplementation in their children ($P < 0.001$). This finding is in line with the results of previous studies carried out by Fesharaki Nia and Imani (18,19). This could partly be due to the fact that employed and educated mothers who have active roles in society have more information and a better attitude in this regard. The overall level of knowledge and practice of mothers in our study was lower than that in a similar study performed by Talebi et al.(9). This discrepancy could partly be explained by the fact that Mashhad is a much more developed and industrial city than Yazd; moreover, there is a greater number of healthcare centres with more professional and experienced staff in Mashhad that can educate the parents regarding health issues more accurately. Therefore, part of the dental team's responsibility should be dedicated to raising the awareness of mothers about the benefits of iron supplementation, their possible cariostatic effects, and ways to reduce tooth staining caused by their use.

Conclusion

This study revealed that the majority of the mothers had sufficient levels of knowledge and practice toward iron supplementation in their children; however, there is still a dearth of attempt in this regard, and more efforts should be considered to improve the mothers' level of knowledge and practice. Since the most important factor in the implementation of iron supplementation is raising the knowledge and practice levels of parents, especially mothers, more efficient education regarding this health issue seems to be a practical solution.

Conflicts of interest

There are no conflicts of interest regarding the publication of this study.

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Corresponding Author

Iman Parisay

Associate Professor of Paediatric Dentistry, Dental Materials Research Centre, Mashhad University of Medical Sciences, Mashhad, Iran

Email: parisayi@mums.ac.ir