



Research Article/Özgün Araştırma

Evaluation of iron prophylaxis in children aged 4-24 months

4-24 aylık çocuklarda demir profilaksisinin değerlendirilmesi

Fedli Emre KILIÇ¹, Osman KÜÇÜKKELEPÇE², Hüseyin TANRIVERDİ³, Erdoğan ÖZ², Habip ALMIŞ³

¹Adıyaman University Training and Research Hospital, 02040, Adıyaman-Turkey

²Adıyaman Provincial Health Directorate, 02040, Adıyaman-Turkey

³Adıyaman University, Faculty of Medicine, 02040, Adıyaman-Turkey

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Abstract

Aim: The aim of this study is to assess the current status of the national iron supplementation program and the utilization of iron prophylaxis in the society, taking into account factors such as education, socioeconomic status, and the recommendations provided by healthcare professionals.

Materials and Methods: A total of 540 patients Children aged 4-24 months admitted to the Pediatrics Outpatient Clinic were evaluated and a total of 540 patients were surveyed. The children were asked whether they used or not regular iron prophylaxis between 4 and 12 months. The data were analyzed using the SPSS 22 software package program

Results: In our study, it was found that 50.8% of children did not use iron prophylaxis or used it irregularly. The most common side effects reported were constipation, diarrhea, and vomiting. Significantly higher rates of supplement use were observed among children with parents who had higher education and income levels. (Mother's education; $p=0.026$, father's education; $p<0.001$, income level; $p=0.015$)

Conclusion: The fact that more than half of the participants in the study did not use iron supplementation or used it irregularly highlights the inadequate access to adequate iron prophylaxis for children. Healthcare professionals should allocate time to families and provide information about iron supplementation.

Keywords: Iron prophylaxis, Infant, Compliance, Side effect, Attitude

Öz

Amaç: Bu çalışmanın amacı, eğitim, sosyoekonomik durum ve sağlık profesyonellerinin önerileri gibi faktörleri dikkate alarak, ulusal demir takviye programının mevcut durumunu ve toplumun demir profilaksi kullanımını değerlendirmektir.

Gereç ve Yöntem: Çocuk Sağlığı ve Hastalıkları Kliniğine başvuran 4-24 aylık çocuklar değerlendirildi ve toplam 540 hastaya anket uygulandı. Çocuklara 4-12 ay arası düzenli demir profilaksisi kullanıp kullanmadıkları soruldu. Analizler SPSS 22 paket programı kullanılarak yapıldı.

Bulgular: Çalışmamızda demir profilaksisi kullanmayan veya düzensiz kullanan çocukların oranı %50,8 idi. Kabızlık, ishal ve kusma en sık görülen yan etkilerdi. Ebeveyn eğitimi ve gelir düzeyi yüksek olanların preparat kullanım oranları anlamlı olarak daha yüksekti. (Anne eğitimi; $p=0,026$, baba eğitimi; $p<0,001$, gelir düzeyi; $p=0,015$)

Sonuç: Katılımcıların yarısından fazlasının demir takviyesi kullanmayan veya düzensiz kullanan grupta yer alması çocukların yeterli demir profilaksisi alamadığını göstermektedir. Sağlık çalışanları ailelere zaman ayırmalı, demir profilaksisi konusunda bilgilendirmelidir.

Anahtar Kelimeler: Demir profilaksisi, Süt çocuğu, Uyum, Yan etki, Tutum.

Yazışma Adresi/Address for Correspondence: Fedli Emre KILIÇ, Adıyaman University Training and Research Hospital, 02040, Adıyaman-Turkey, E-mail: doctoremre2002@gmail.com

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intihal incelemesinden geçirilmiştir.



Introduction

Iron is one of the essential substances for producing hemoglobin in erythrocytes, and it takes part in the structure and functionality of many enzymes. Iron deficiency develops long before clinical symptoms appear.¹ The iron consumption in the body increases during periods of life such as pregnancy and infancy.² The mother provides about half of the iron which demanded for the infant's development in the last trimester of pregnancy. So, almost all healthy infants are born with necessary iron in their bodies for the first six months. Since preterm infants are disadvantaged, they should be evaluated separately for iron prophylaxis.³ However, even if infants are effectively breastfed, they require additional iron supplementation after four to six months because the iron content in breast milk is insufficient.⁴ Iron deficiency (ID) and iron deficiency anemia (IDA) can lead to significant functional impairments in infants and children. According to the American Academy of Pediatrics (AAP), IDA has a negative impact on infants' behavioral development and cognitive functions.⁵

Iron deficiency is the primary cause of anemia resulting from nutritional deficiencies.^{4,6} Iron deficiency is prevalent in both developed and developing countries. According to the 2018 data from the World Health Organization (WHO), the global prevalence of anemia in children under five years of age was reported as 39.8%.⁷ While there is a lack of specific statistics on the prevalence of iron deficiency (ID) in infants under one year of age, the National Health and Nutrition Examination Survey (NHANES) data from 2016 revealed a prevalence of 13.5% for ID in children aged 1-2 years.⁸ In Turkey, the prevalence of anemia in the 5-59 month age group has been reported as 30%.⁶

In Turkey, the Ministry of Health launched an initiative called 'Turkey as Iron' in 2004, aiming to combat iron deficiency and anemia. The project of 'Turkey as Iron' initiative aimed to raise awareness about iron-rich nutrition, promote exclusive breastfeeding for the first six months, encourage breastfeeding alongside complementary foods until the age of two, and provide free iron supplementation for five

months to all term babies between the ages of 4-12 months (or starting from the second month for preterm babies). Furthermore, the initiative aimed to recommend iron therapy for infants between 13-24 months of age if they are found to be anemic.⁹ For the prevention of iron deficiency and anemia, daily iron supplementation is recommended as a public health intervention in infants and young children aged 6-23 months, particularly in settings where anemia is highly prevalent.¹⁰

The objective of this study was to assess the current status of the national iron supplementation program and the utilization of iron prophylaxis in the society, taking into account factors such as education, socioeconomic status, and the recommendations provided by healthcare professionals.

Materials and Methods

The study is a cross-sectional study. This study was conducted in Adıyaman, which is located in the southeast Anatolian region of Turkey. Children aged 4-24 months who applied to the hospital were included in the study. To reach this sample, patients who admitted the pediatrics clinic of Adıyaman Training and Research Hospital were used. In the present study, a questionnaire was applied to parents' of the patients who met the inclusion criteria of 540 children between 20.12.2021-20.06.2022. The questionnaire used in the study consisted of 15 questions covering various aspects, including demographic information, mother's employment status, parents' educational background, monthly income, whether the child received iron supplementation between 4-12 months, the duration of supplementation, reasons for discontinuation, potential side effects experienced, and whether iron supplementation was recommended by a physician. Children with chronic diseases such as congenital heart disease, chronic liver/kidney disease, neurological disease, and Down syndrome were excluded from the study. In the study, children who consistently used a daily iron supplement of 1 mg/kg were considered to have adhered to iron supplementation regularly.

Type of the study

The study is a cross-sectional study.

The sample size of the study

600 patients aged 4-24 months applied to the pediatric outpatient clinic. Of these, 540 patients were included in the study after their families were informed about the study and their consent was obtained. The participation rate in the study was 90%.

Data collection tools

A standard information collection form was created by the researchers, including questions such as the child's age, gender, mother's age, parents' educational status, monthly income of the family, whether the child uses iron supplement and if not, the reason, and the information received from the participants was entered into this form.

Data analysis

Analyzes were evaluated in 22 package programs of SPSS (Statistical Package for Social Sciences; SPSS Inc., Chicago, IL). In the study, descriptive data are shown as n and % values in categorical data and mean±standard deviation (mean±SD) and median (minimum-maximum) values in continuous data. Chi-square analysis (Pearson Chi-square) was used to compare categorical

variables between groups. The statistical significance level in the analysis was accepted as $p<0.05$.

Ethics committee approval

Ethics committee approval numbered 2021/09-28 was obtained from Adıyaman University Non-Interventional Clinical Research Ethics Committee numbered 09 dated 16.11.2021 for the study. The study was conducted under the principles of the Declaration of Helsinki.

Results

540 children with a mean age of 11.9 ± 5.7 months and a median age of 11 (min=4-max=24) months were included in the study. 50.9% of the children were boys, and 49.1% were girls. The mean age of the mothers were 29.9 ± 5.6 , and 30% were in the 25-29 age group 84.6% of the mothers were unemployed. (Table 1).

Iron supplement usage was recommended for 461 (85.4%) of the children. It was observed that 14.6% did not receive a recommendation for iron supplementation from their family physician. 308 (57%) of the children used prophylactic iron supplementation. 49.2% of the participants used iron supplementation regularly, while 7.8% used it but did not regularly (Figure 1).

Table 1. Demographic characteristics of children

		n	%
Gender	Male	275	50.9
	Female	265	49.1
Maternal age category	20-24	105	19.4
	25-29	162	30.0
	30-34	145	26.9
	≥35	128	23.7
Mother's job	Unemployed	457	84.6
	Working	83	15.4
Mother's education	Literate	16	3.0
	Primary school	100	18.5
	Middle school	113	20.9
	High school	154	28.5
	University	157	29.1
Father's education	Literate	13	2.4
	Primary school	82	15.2
	Middle school	92	17.0
	High school	167	30.9
	University	186	34.4
Monthly income (Turkish Lira)	<2500	136	25.2
	2500-5000	235	43.5
	5000-10000	124	23.0
	>10000	45	8.3

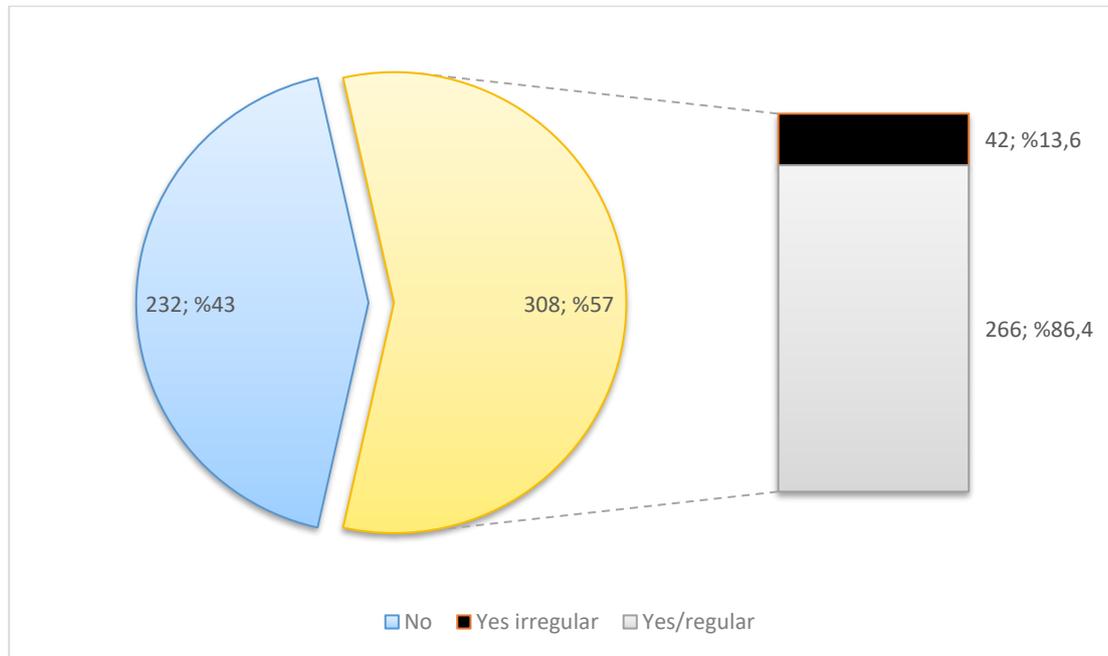


Figure 1. Children's use of iron supplementation and patterns.

While 87.7% of children using iron supplementation are under six months of age, 12.3% of them were six months and above. 91.9% of the children who used supplements complied with the accurate dosage. Side effects were observed in 16.6% of children who used supplements, and the bad taste was observed in 5.9%, vomiting in 13.7%, diarrhea

in 15.7%, constipation in 51%, and tooth discoloration in 11.8%. Of the children using the supplement, 35.7% gave up using the iron supplement, 64.5% of the children gave up using the supplement because the prophylaxis period ended, 8.2% because the supplement was finished, 20.9% because of neglect and 6.4% because of side effects (Table 2).

Table 2. Characteristics of children regarding prophylactic iron use.

		Number	%
Supplementation start age	<6 months	270	87.7
	≥6 months	38	12.3
Dosage compliance	Yes	283	91.9
	No	25	8.1
Side effect	Yes	51	16.6
	No	257	83.4
Type of side effect	Bad taste	3	5.9
	Vomiting	7	13.7
	Diarrhea	8	15.7
	Constipation	26	51.0
	Discoloration of teeth	6	11.8
	Other	1	2.0
Supplement quitting status	Yes	110	35.7
	No	198	64.3
Quitting time	1-6 months	12	10.9
	7-12 months	92	83.6
	13-18 months	6	5.5
Reason for quitting	Prophylaxis expired	71	64.5
	Supplement expired	9	8.2
	Neglect	23	20.9
	Side effect	7	6.4

The iron usage rate of children of working mothers (74.7%) was found to be significantly higher than the rate of unemployed mothers (53.8%) ($p < 0.001$). The rate of iron intake was

found to be significantly higher in children whose mother's education level ($p = 0.026$) and father's education level ($p < 0.001$) were in high school and above. As the monthly income

increases, the rate of iron use also increases ($p=0.015$) (Figure 2). Iron use rate (66.2%) of those who were recommended the supplement

was significantly higher than those who were not recommended (3.8%) ($p<0.001$) (Table 3).



Figure 2. Rate of using iron prophylaxis by monthly income.

Table 3. Comparison of iron usage status according to various parameters.

Usage of iron		Yes		No		p^*
		Number	%	Number	%	
Gender	Male	160	58.2	115	41.8	0.584
	Female	148	55.8	117	44.2	
Mother's age	20-24	66	62.9	39	37.1	0.312
	25-29	84	51.9	78	48.1	
	30-34	86	59.3	59	40.7	
	35 and over	72	56.3	56	43.8	
Mother's occupation	Unemployed	246	53.8	211	46.2	<0.001**
	Working	62	74.7	21	25.3	
Mother's education	Middle School and below	118	51.5	111	48.5	0.026**
	High school and above	190	61.1	121	38.9	
Father's education	Middle School and below	87	46.5	100	53.5	<0.001**
	High school and above	221	62.6	132	37.4	
Monthly income (Turkish Lira)	<2500	68	50.0	68	50.0	0.015**
	2500-5000	128	54.5	107	45.5	
	5000-10000	79	63.7	45	36.3	
	>10000	33	73.3	12	26.7	
Supplement recommendation status	Yes	305	66.2	156	33.8	<0.001**
	No	3	3.8	76	96.2	

*Chi-square analysis was applied. ** $p<0.05$

Discussion

Despite national and international iron supplementation programs, iron deficiency continues to be one of the leading cause of anemia. According to international publications, prophylaxis programs have been reported to be unsuccessful, and the incidence of iron deficiency (ID) in infants remains around 20-30% depending on the cultural and

socioeconomic characteristics of the countries. Additionally, the prevalence of iron deficiency anemia (IDA) is reported to range between 4-12%.¹¹⁻¹³ While the starting ages and dosages of iron supplementation programs may vary across different countries, the World Health Organization recommends the continuation of such programs.¹⁴ In Turkey, free iron

supplements are typically provided to citizens upon request at primary healthcare facilities.

Karapınar et al. found regular iron use 33%, and in another study conducted in Ankara, it was found 54.2%.^{1,6} In a study conducted by Mutafoğlu et al.⁹ in 2019, it was observed that the prevalence of IDA decreased from 44.8% in the ninth month of infancy to 33% in the 24th month following iron supplementation. In a study conducted in 2013 to evaluate the effectiveness of the iron prophylaxis program implemented in Turkey, the prevalence of anemia was reported as 20.8% in a previous study. However, following the implementation of the program, this rate decreased significantly to 10.54%.^{15,16} Although the effectiveness of the iron prophylaxis program in Turkey is significant, the regular use of iron supplements is still not sufficient. The present study revealed that only 49.2% of children use iron supplements regularly. This indicates that a considerable portion of individuals still do not adhere to regular prophylactic use. The rate of regular iron supplement usage observed in the study was consistent with the existing literature.

In a study by Karapınar et al.¹, iron usage was recommended by the family physician to 74.5% of the participants, while this rate was found to be 85.3% in the present study. Although the rate of family physicians recommending iron supplements in the present study is better than the literature, 14.7% of the patients did not receive iron supplementation advice from their family physicians is a situation that needs to be examined.¹ Health workers may not be able to devote enough time to this issue due to the density of their working conditions.

A study conducted in Ankara revealed that the rate of discontinuation of the supplement due to side effects was 8.5%. The side effects observed in this study were reported as teeth discoloration, vomiting, and diarrhea, in descending order of frequency. Furthermore, 36% of the participants who discontinued the supplement in the study did so as a result of neglect.¹⁴ In a study published in 2013, vomiting (risk ratio 1.38, 95% CI 1.10–1.73) and fever (1.16, 1.02–1.31) were more prevalent in children receiving iron.¹⁷ In the

current study, consistent with the existing literature, 6.4% of the participants discontinued the supplement as a result of experiencing side effects. The most frequently reported side effects were constipation, diarrhea, and vomiting. Additionally, a significant proportion of participants (20.9%) discontinued iron prophylaxis due to neglect. However, the discontinuation of iron supplementation both due to side effects and neglect indicates that iron deficiency is the prevailing cause of anemia within families, suggesting a lack of comprehensive understanding regarding its implications. For this reason, it is essential for healthcare professionals to provide families with information when initiating iron supplementation. To further support the efforts of healthcare professionals, nationwide dissemination of information should be conducted through media channels and public service announcements. These briefings should not only emphasize the significance of iron supplementation treatments but also provide guidance on increasing dietary iron intake.

In a study conducted by Ali et al.¹⁸ in Pakistan in 2001, it was discovered that education and socioeconomic status exhibited a positive correlation with iron intake and a negative correlation with anemia. Similarly, another study demonstrated a positive correlation between maternal education and the use of prophylactic iron supplements.¹ These findings were consistent with a separate study conducted in Cape Verde in 2014¹⁹. Moreover, a comprehensive analysis of data from various regions including Asia, North Africa, the Middle East, Sub-Saharan Africa, and Latin America in 2018 indicated a significantly lower prevalence of anemia among children from families with higher socioeconomic status and mothers with higher levels of education.²⁰ In alignment with the existing literature, the present study revealed that individuals with higher income and education levels in their parents were significantly more inclined to utilize iron supplementation.

In a study conducted by Çullas-İlarslan et al.⁶ it was observed that the rate of iron

supplementation usage was significantly higher in children whose families were reminded about the importance of iron supplementation. The present study yielded similar results, indicating a high compliance rate, consistent with findings in the existing literature.

The limitations of our study include the fact that it relied on a survey design, had a small sample size, and was conducted exclusively within a single hospital setting.

Conclusion

According to our study findings, parents' educational status and higher socioeconomic level contribute to increased compliance with iron prophylaxis. Reminders from healthcare professionals to families have a positive impact on the usage of iron prophylaxis. Additionally, implementing family-centered iron supplementation programs and strategies to enhance knowledge levels can further promote the utilization and adherence to iron prophylaxis.

Ethics Committee Approval

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Informed Consent

Informed consent was obtained from the individuals participating in the study.

Authors Contributions

All of the authors contributed at every stage of the study

Conflict of Interests

There is no conflict of interest to declare.

Financial Disclosure

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Statements

Any part or all of the work is not under consideration and has not been published in any other journal or congress.

Peer-review

Externally peer-reviewed.

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