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Effect Of Home Visits by Nurses on Hemoglobin Levels Of 6-Month-Old Infants. A Nonrandomized Controlled Trial

6 Aylık Bebeklere Hemşire Tarafından Yapılan Ev Ziyaretlerinin Bebeklerin Hemoglobin Değerine Etkisi- Bir Nonrandomize Kontrollü Çalışma

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ABSTRACT

Background: Iron-deficiency anemia has a high prevalence among infants across the world including our country and contributes substantially to the global burden of disease. Therefore, it is a priority to develop preventive strategies to protect and promote infant health. This study sought to investigate the effect of home visits for 3 months by nurses on the hemoglobin levels of 6-month-old infants measured at 9 months.
Methods: This study adopted a quasi-experimental design in accordance with the TREND (Transparent Reporting of Evaluations with Nonrandomized Designs) checklist. The study sample consisted of 100 6-month-old infants, 50 in the intervention group and 50 in the control group. Infants in the intervention group received home visits three times in total, once every month. Control group infants received routine care. Data were collected using the questionnaire form and home monitoring and care form for 6–9-month-old infants. Data were analyzed using descriptive statistics, independent samples t-test, chi-square test, and Fisher's exact test.
Results: Mean hemoglobin levels were higher in infants in the intervention group compared with that of the control group ($p < 0.05$). Hemoglobin levels were <11 g/dL in 48.0% of the infants in the intervention group and 68.0% of the infants in the control group ($p < 0.05$).
Conclusions: This study showed that iron-deficiency anemia remains a serious public health concern in the infants included in the study and home visits by nurses are effective in protection against and prevention of iron-deficiency anemia. Further research is warranted to gather a more robust evidence base.

Keyswords: 6-Month-Old Infants, Nurse, Home Visit, Hemoglobin, Iron-Deficiency Anemia.

ÖZET

Giriş: Dünyada ve ülkemizde süt çocuklarında demir eksikliği anemisi yüksek prevalansa sahiptir ve küresel hastalık yüküne önemli bir katkı verir. Bu nedenle bebeklerin sağlığını korumak ve geliştirmek için koruyucu stratejilerin geliştirilmesi önceliklidir. Bu araştırmanın amacı, 6 aylık bebeklere 3 ay boyunca hemşire tarafından yapılan ev ziyaretlerinin bebeklerin 9. ayda ölçülen hemoglobin değerine etkisini belirlemektir.
Metod: Bu çalışmada, Transparent Reporting of Evaluations with Nonrandomized Designs (TREND) kontrol listesine uygun olarak yarı deneysel bir tasarım benimsenmiştir. Çalışmanın örneklemini, 50 deney, 50 kontrol grubu olmak üzere toplam 100 6 aylık bebek oluşturmuştur. Deney grubunda olan bebeklere ayda bir 3 defa ev ziyareti yapılmıştır. Kontrol grubu bebeklerine ise rutin izlemler yapılmıştır. Veriler tanımlayıcı istatistik, independent samples t-testi, ki-kare testi ve fisher's exact testi kullanılarak analiz edilmiştir. Tüm analizler için 0,05'in altındaki p değeri anlamlı kabul edilmiştir.
Bulgular: Araştırma bulgularında; deney grubundaki bebeklerin hemoglobin ortalaması kontrol grubuna göre daha yüksek bulunurken ($p<0.05$), deney grubundaki bebeklerin %48.0'nın, kontrol grubu bebeklerin %68,0'ının ise hemoglobin değerinin 11 gr/dl'nin altında olduğu görülmüştür ($p<0.05$).
Sonuçlar: Bu çalışma kapsamına alınana bebeklerde demir eksikliği anemisinin ciddi bir halk sağlığı sorunu olmaya devam ettiğini, bebekleri demir eksikliği anemisinden koruma ve önlemede hemşire tarafından yapılan ev ziyaretinin etkili olduğunu göstermiştir. Daha sağlam bir kanıt temeli sağlamak için daha fazla araştırmaya ihtiyaç vardır.

Anahtar Kelimeler: 6 Aylık Bebek, Hemşire, Ev Ziyareti, Hemoglobin, Demir Eksikliği Anemisi.

INTRODUCTION

The World Health Organization (WHO) states that anemia has a global prevalence of 39.8% in children (6–59 months old) (1) and is a common and moderate public health concern, leading to increased mortality and morbidity in children (1-5). Iron-deficiency anemia (IDA) is the most common type of anemia in our country and across the world, with rates ranging between 48% and 75% during infancy

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(1,3,6-8). IDA is a condition that commonly affects children in underdeveloped and developing countries and contributes substantially to the global burden of disease (1,4,9). In our country, the prevalence of IDA at the age of 0–6 years increased from 5.4% in 2016 to 6.9% in 2019 (10). Despite the increasing number of epidemiological studies showing the high prevalence of IDA in infants in various countries, including our own, the effectiveness of various strategies on the prevention of and protection against IDA in infants remains uncertain (2,5,8,11). Therefore, it is a priority to develop new strategies for early interventions and prevention of IDA in infants.

Iron deficiency is more common after the 6th month of life when growth accelerates, as breast milk alone does not meet all nutritional needs, including iron. Because 6–12-month-old babies are vulnerable to IDA, interventions against IDA during these months are crucial (2,3,5-7,9). Numerous studies have shown that IDA severely affects growth, development, and cognitive functions in children aged <2 years; the effects persist despite treatment, and the adverse effects can also affect children in later periods (2,4,6-9,12,13). The most serious consequence of IDA in terms of public health is psychomotor retardation, which may not improve with treatment (4,7). Thus, to prevent and ensure early diagnosis of IDA in infants after the 6th month of life, it is necessary to investigate factors that predispose infants to this condition and provide a holistic care and treatment using the identified factors (7-9). To our knowledge, a limited number of studies has been conducted to control IDA, and these studies have attempted various nutritional interventions (2,5,14); however, the practice of home visits by nurses has not yet been investigated in the context of preventing IDA.

Home visits are an important intervention for monitoring babies in their environment, identifying all relevant factors affecting them, observing mistakes, and developing early interventions (15,16). The WHO recommends home visits for all babies from the first week to at least 2 years after birth. The frequency, form, and content of home visits vary across countries and different health systems in countries (15,16). Although there is no mandatory requirement for nurses to conduct home visits in Turkey, the practice of home visits for monitoring infants and children in family health centers providing primary care services has gradually decreased, causing a decline in the effectiveness of services (17,18). According to a 2012 study, the rate of timely and appropriate monitoring of infants decreased from 33% in 2006 to 18% in 2011, and only 11.4% of the participants in the same study reported having received home visits by healthcare workers (18). Increasing home visits in practice requires evidence to demonstrate its importance and necessity for nurses. Although there is increasing evidence in support of home visits, there is no strong evidence that home visits by nurses prevent and protect against IDA in infants; evidence-based research is needed to clarify the effectiveness of such interventions. The findings from this study provide useful information for all health professionals working in the field of public health on ways to reduce the high prevalence of IDA in infants, which remains a global public health concern.

This study was designed as a nonrandomized controlled study to determine the effect of home visits for 3 months by nurses on the hemoglobin levels in 6-month-old infants measured at 9 months as part of routine follow-up. The lower limit of hemoglobin was considered as 11 g/dL in the diagnosis of anemia (−2 standard deviations (−2SD) below the normal for age according to the WHO criteria) (1).

METHODS

Study Type

The study was designed and conducted in accordance with the TREND (Transparent Reporting of Evaluations with Nonrandomized Designs) guidelines developed specifically to guide standardized reporting of experiments and controlled trials (19).

Hypotheses

H1. Infants in the intervention group followed up through home visits by a nurse for 3 months will have higher mean hemoglobin scores than those in the control group.

H0. There will be no difference between the mean hemoglobin scores of the infants in the intervention group receiving home visits by a nurse for 3 months and the mean hemoglobin scores of the infants in the control group.

Study Setting

The study was conducted in a single-family health center providing primary health care services in Savur District of Mardin Province, Turkey. There were 183 six-month-old infants registered at this center. The infants were monitored by nurses. Infants who are 0 to 1 year old undergo a total of ten routine follow-ups during the months determined by the Ministry of Health. Of the ten follow-ups, two occur between 6 and 9 months of age—8th follow-up at month 6 and 9th follow-up at month 9. These follow-ups are conducted in the centers and not at home. Follow-ups 8 and 9 consist of the following routine exams performed by nurses:

Measurement of weight, height, and head and chest circumference, which are used to generate growth and development curves.

Examination of the anterior fontanelle.

Checking vaccination status and administering hepatitis B (III), DTaP-IPV-Hib (III), OPV (I) vaccines at the end of the month 6.

Inquiring about vitamin D and iron supplementation.

Inquiring about breastfeeding status and providing information about complementary feeding.

Population and Sample of the Study

The study population consisted of 183 six-month-old infants registered at a family health center in January 2023. The sample size of the study was calculated using G*Power (version 3.1.9.2) program for power analysis. A study by Beyler (6), which is similar to the present study, reported a mean hemoglobin level of 11.26 ± 0.83 g/dL for 6–12-month-old infants; this was increased by 1 g/dL in our study, which yielded 12.26 ± 0.83 g/dL. Formulating a two-tailed hypothesis for independent groups, with 95% power and a 0.05 Type-1 error rate, yielded a minimum sample size of 19 individuals in each group. To increase the power of the study and allow for possible dropouts from the study, the sample size calculated in the power analysis was further increased by 32%, which resulted in a total of 50 six-month-old infants, 25 in the intervention group and 25 in the control group. Post-hoc power analysis conducted after the research yielded a power (1-β) of 0.533, which indicated an insufficient sample size. Thus, the study sample was increased by another 25 subjects for the intervention group and 25 subjects for the control group. Post-hoc power analysis was performed again with a total of 100 infants, which yielded a power (1-β) of 0.998, and thus the study was completed. The names of the infants registered in the family health center were written on papers and placed in a bag, and assignments to the experimental and control groups were made through a random drawing method. Finally, the study was completed with 50 participants in the intervention group and 50 in the control group (Figure 1).

Inclusion and Exclusion Criteria:

The following are the inclusion criteria:

• The infant is 6 months old

• The infant has not started on complementary feeding

• Follow-up for 3 months

• The infant has not been diagnosed with any medical condition

The following are the exclusion criteria:

• Infants older than 6 months

• Infants started on complementary feeding

• Infants not followed up for 3 months

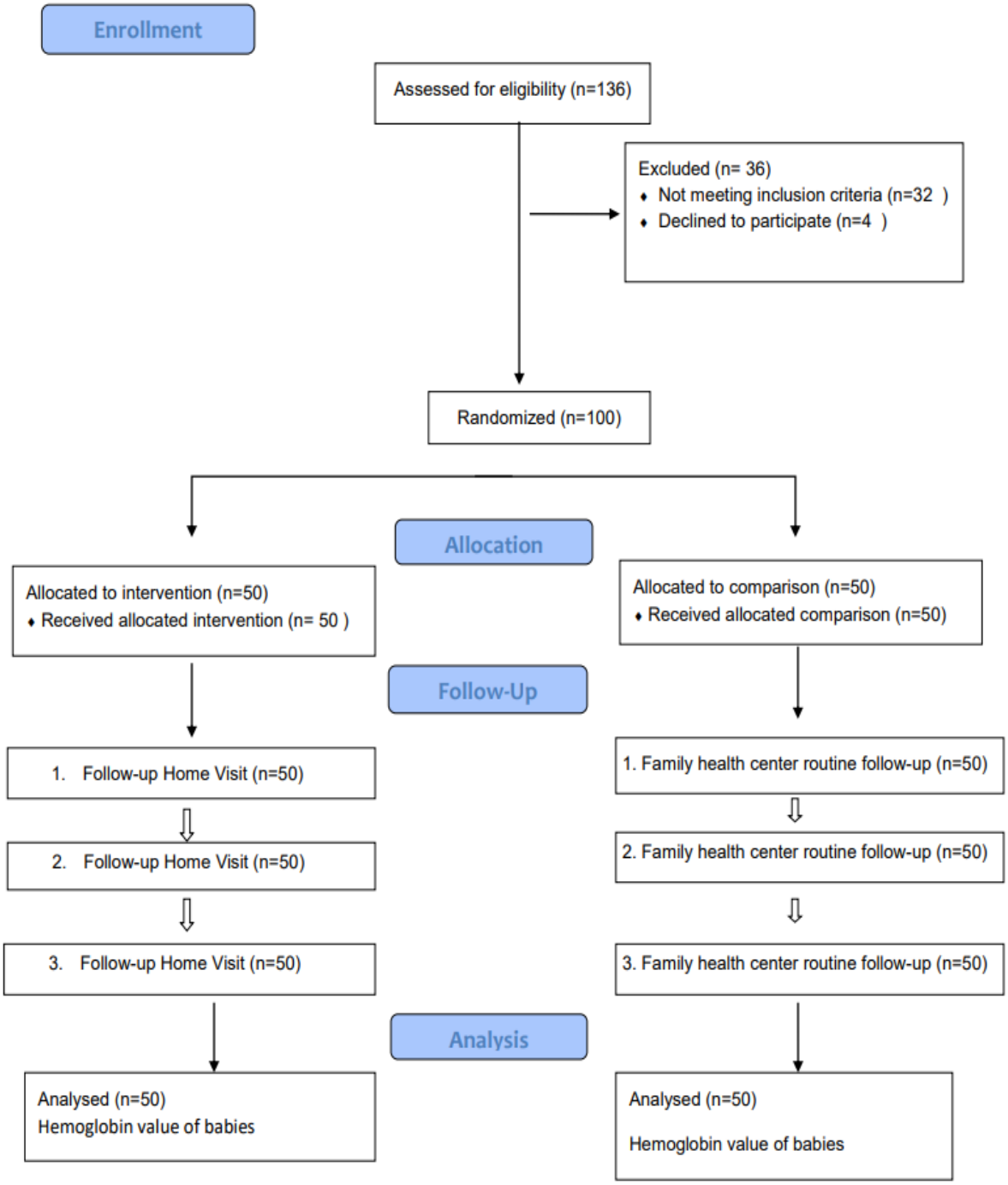

Figure 1. Flow chart of nonrandomized design and participants

Study Variables

Independent variables: Sociodemographic characteristics of the mother and infant—age, maternal education level, number of children, sex, caretaker of the infant, parents' occupation, household income, type of family, etc.

Dependent variables: Follow-up findings relating to the infant and mother as indicated in the home visit and care form, such as hemoglobin level.

Data Collection Tools

1. Questionnaire Form: A questionnaire was created by the researcher based on a literature review (2-10) and an expert opinion. It consisted of 13 questions that inquire about sociodemographic data such as age, sex, mother's education level, number and age of the siblings of the infant, if any, parents' occupation, household income, type of family, etc.

2. Home Monitoring and Care Form for 6–9-Month-Old Infants: The form was developed by the researchers using the infant monitoring protocols issued by the Ministry of Health, General Directorate of Public Health as part of primary health care.

3. Maternal Informed Consent Form: The study was conducted in accordance with the Declaration of Helsinki and informed written consent was obtained from all participants.

4. Complementary Feeding Initiation and Healthy Maintenance Training Booklet: The form was developed by the researchers using the infant feeding guidelines issued by the Ministry of Health, General Directorate of Public Health as part of primary health care.

Steps of the Research

The research was conducted from January 03 to March 31, 2023 for the first group and from April 02 to June 30, 2023 for the second group.

Intervention Group

Visit 1: The visit was conducted for the intervention group; the researcher called the caretaker by phone and got an appointment for a home visit. The researcher conducted a maximum of three visits on one day depending on the proximity of homes. The first home visits lasted for 40–60 min. These visits involved the examination of infants' growth and development, monitoring, and care for the 6-month-old infants based on the questionnaire and Home Monitoring and Care Form. Status of iron and vitamin D supplementation was inquired and caretakers were trained on regular use of supplementation. Home visits also allowed observations and interviews to look into infants' home environment (physical environment and hygiene), cultural characteristics of the family (parents' beliefs and perceptions toward the infant, etc.), and lifestyle (family relations, perspectives toward the infant, etc.). Because the first visit coincided with the infant's transition to complementary feeding, the mother was given a preplanned training on initiating and maintaining complementary feeding to ensure that infants were actually started on complementary feeding. Finally, a second home visit was planned.

Visit 2: It was conducted 1 month after the first visit and covered the monitoring, examination, and care of the 7-month-old infants as instructed in the Home Monitoring and Care Form. The second home visit lasted for 30–60 min and focused mostly on infants' complementary feeding patterns and frequency and allowed detailed observations and interviews with the mother. Shortages were identified, the mother was trained and counseled on this subject, and a 1-month feeding plan was developed for the 7–8-month-old infant. A third home visit was planned.

Visit 3: It was conducted a month after the second visit and covered the monitoring, examination, and care of the 8-month-old infants as instructed in the Home Monitoring and Care Form. The third home visit lasted for 30–60 min and allowed for reviewing compliance with the infant feeding plan that had been developed at the time of the second home visit. Alternative feeding plans were created for components of the plan that could not be implemented. In cooperation with the mother, the researcher prepared a 1-month feeding plan for the 9-month-old infant. Finally, the visit was concluded by telling the family that the researcher would seek an appointment for monitoring and measurement of the hemoglobin level of the 9-month-old infant at the family health center.

Control Group

Checkup 1: The first interview with control group infants and their mothers happened at family health centers. The first checkups covered routine growth and development measurements and vaccinations for 6-month-old infants. The researcher inquired mothers about their knowledge of transition to

complementary feeding and provided them the preplanned training on initiating and maintaining complementary feeding. The first checkup lasted for 20–45 min.

Checkup 2: The infants underwent routine growth and development measurements and received routine vaccinations scheduled for 7-month-old babies. The mother was inquired about the process of complementary feeding, and shortages and mistakes (feeding mixed bread and cheese with tea and feeding spicy foods) were identified and rectified. The second checkups lasted for 20–30 min.

Checkup 3: The infants underwent routine growth and development measurements and received routine vaccinations for 8-month-old babies. The mother was inquired about the process of complementary feeding, and shortages (such as iron and vitamin D usage and complementary foods) were identified and rectified. The third checkups lasted for 20–30 min.

Ethical Aspects of the Research

Permissions were obtained from XXX University Clinical Research Ethics Committee (15.11.2021. 20/21), Ministry of Health Scientific Research, and Mardin Provincial Health Directorate Scientific Research Studies Applications Review and Evaluation Committee (10.11.2021 E-37201737-949-940).

Blinding

In this study, the researcher assistant who collected the data was masked to the study groups and the intervention program. Moreover, the statistician who did the data analysis was blinded to the allocation of the participants in the study groups, as well.

Statistical Analysis

The study data were analyzed using IBM SPSS Statistics v.22.0 suite. Descriptive statistics were presented as mean ± SD and minimum and maximum values for continuous variables, and number and percentage for nominal variables. Continuous variables were checked for normality using the Shapiro–Wilk test and normal distribution graphs. Significance of differences was analyzed using independent samples t-test for continuous variables and chi-square test and Fisher's exact test for categorical variables. A p-value <0.05 was considered significant for all analyses. Answers to open-ended questions were grouped under common headings.

RESULTS

Of the infants involved in the study, 52.0% were female, 42.0% were the third child in the family, and all of them were cared for by the mother. The mean age of the mothers was 35.0 ± 7.0 years, and 61.0% of the mothers were ≥30 years of age. The majority of the mothers (88.0%) stated that they were not working, while almost all of the fathers (99.0%) were employed and 85.0% of them had a monthly income equal to minimum wage or above. Statistical analyses showed no significant difference in the sociodemographic characteristics of the intervention and control groups ($p > 0.05$).

The distribution of infants' nutritional status by group is given in Table 1. At the time of the first, second, and third visits/checkups, 98.0% of the infants in the experimental group and 94.0% of the infants in the control group were breastfed, which corresponded to 96.0% on average. Visits/checkups performed over 3 months showed similar rates of breastfeeding in the intervention and control groups ($p > 0.05$). The percentage of infants with more than seven daytime nursing sessions at the first checkup and at the last checkup was 98.0% and 71.4% in the intervention group and 76.6% and 40.4% in the control group ($p < 0.05$). For night-time breastfeeding during the third visit/checkup, 2.0% of the infants in the intervention group and 6.0% of the infants in the control group were not breastfed at night ($p < 0.05$).

At the third visit/checkup, the proportion of infants who received more than three meals that included complementary food other than breast milk was 40.0% in the intervention group and 62.0% in the control group ($p < 0.05$). Analysis of the content of the complementary food received by the infants during the third visit/checkup showed that 98.0% of the infants in the intervention group and 78.0% of the infants in the control group consumed all food groups ($p < 0.05$).

Table 1. Distribution of Infants' Nutritional Status by Groups

Variable	Lower Level	Experiment		Control		Total		Statistical Significance x2 / p
		n	%	n	%	n	%	
Number of breastfeeding days, 1st month. Experiment n=49 Control n: 47	7 and under	1	2,0	11	23,4	12	12,5	x^2 = 8,152 **P=0.004**
	over 7	48	98,0	36	76,6	84	87,5	
Number of breastfeeding days, 3rd month n=96	7 and under	14	28,6	28	59,6	42	43,8	x^2 = 8,152 **P=0.004**
	over 7	35	71,4	19	40,4	54	56,3	
Number of breastfeeding nights 1st Month n = 96	Not breastfeeding	1	2,0	3	6,0	4	4,0	x^2 = 1.813
	1 time	7	14,0	10	20,0	17	17,0	
	more than 1	42	84,0	37	74,0	79	79,0	P=0.178
Number of breastfeeding nights 3rd Month n = 96	not breastfeeding	1	2,0	3	6,0	4	4,0	x2 = 7,920
	1 time	36	72,0	16	32,0	52	52,0	
	more than 1	13	26,0	31	62,0	44	44,0	**P=0.005**
Number of Supplementary Food meals 1st month	3 and under	42	84,0	36	72,0	78	78,0	x^2 = 1.457
	over 3	8	16,0	14	28,0	22	22,0	P=0.227
Number of Supplementary Food meals 3rd month	3 and under	30	60,0	19	38,0	49	49,0	x^2 = 4.842
	over 3	20	40,0	31	62,0	51	51,0	**P=0.028**
Supplementary food content 1 month	Dairy and meat group nutrients	47	94,0	47	94,0	94	94,0	x^2 = 0.000 P=0.661
	Formula	3	6,0	3	6,0	6	6,0	
Supplementary food content 3 months	Dairy and meat group nutrients	0	0	2	4,0	2	2,0	x2 = 8,888 **P=0.003**
	All foods	49	98,0	39	78,0	88	88,0	
	Just Mama	1	2,0	9	18,0	10	10,0	
Baby iron supplement use case	Regular (4 drops)	50	100,0	42	84,0	91	91,0	X^2 =* **P=0.006**
	Irregular	0	0,0	8	16,0	9	9,0	
Baby vitamin d usage status	Regular (3 drops)	50	100,0	41	82,0	91	91,0	x^2 =* **P=0.003**
	Irregular	0	0,0	9	18,0	9	9,0	

n= Number %= Percentage ratio X^2= Chi- Square test p = Significance value * Fisher-Exact Chi- Square test

All the mothers in the intervention group and 84.0% of the mothers in the control group stated that they regularly gave iron supplements to their infants ($p < 0.05$). Regarding the use of vitamin D, all of the mothers in the intervention group and 82.0% of the mothers in the control group stated that they regularly gave vitamin D supplements to their infants ($p < 0.05$). Although not shown in the table, 68.0% of the participating mothers reported having used iron supplements regularly during pregnancy, and 80.0% reported having used vitamin D supplements regularly during pregnancy. The proportion of the mothers who reported having an unbalanced diet at the time of the first, second, and third visit/checkup was 10.0%, 6.0%, and 8.0% in the intervention group and 10.0%, 6.0%, and 8.0% in the control group, respectively ($p > 0.05$). All of the mothers in both the intervention and control group reported consuming tea with meals, and 44.0% of the mothers reported drinking more than two cups of tea ($p > 0.05$). There was insignificant difference between the nutritional characteristics of the mothers in both groups, suggesting that mothers in both groups had a similar nutritional status ($p > 0.05$).

Table 2. Hemoglobin Values of Infants by Groups

		Experiment		Control		Statistical meaningfulness
Variable	**Lower Level**	**X±SS**	**Min- max**	**X±SS**	**Min-Max**	***t/p***
Baby Hemoglobin	**3rd follow upend**	12.01±1.115	10,20-14.80	11.47±1.034	9,100-13.40	2.510/ **0.014**

x= Average SS= Standard Deflection t= Independent in groups t test p= meaningfulness Value

		Experiment		Control		Total		Statistical meaningfulness
Variable	**Lower Level**	**n**	**%**	**n**	**%**	**n**	**%**	**x^2 /p**
Baby Hemoglobin	11gr/dl under	24	48.0	34	68.0	58	58.0	**4.105/0.043**
	11gr/dl And above	26	52.0	16	32.0	42	42.0	

n = Number %= Percentage rate x^2 = Chi- Square test p= meaningfulness value.

Table 2 presents mean hemoglobin levels and hemoglobin ratios of the infants compared to the minimum levels for IDA indicated by the WHO. Analysis of blood samples collected from the infants after the study showed that the mean hemoglobin level of the infants was 12.01 ± 1.115 g/dL in the intervention group and 11.47 ± 1.034 g/dL in the control group ($p < 0.05$). For hemoglobin ratios, 52.0% of the infants in the intervention group had hemoglobin >11 g/dL, whereas 68.0% of the infants in the control group had hemoglobin <11 g/dL. The difference between mean hemoglobin levels of the infants in the intervention and control groups was statistically significant ($p < 0.05$).

DISCUSSION

This study is the first trial in Turkey to investigate the effect of home visits by nurses on the hemoglobin levels of 9-month-old infants and guides the development of iron-deficiency prevention strategies in infants, the group at highest risk for IDA (1), which is a moderate global public health concern. In this study, the mean hemoglobin level of the infants in the intervention group was higher than that of the infants in the control group (Table 2; $p < 0.05$). The minimum hemoglobin level determined by the WHO for 9-month-old infants is 11 g/dL (1). The proportion of infants below this level was 48.0% in the intervention group and 68.0% in the control group (Table 2; $p < 0.05$). This is the main result of this study and demonstrates that home visits by nurses once a month over 3 months helped improve hemoglobin levels in infants. These findings cannot be compared with the results of previous studies because, to our knowledge, no previous study has investigated the effect of such an intervention on IDA. However, one study experimented a home-based intervention on infants with IDA and found the intervention to be effective (13). The present study, on the other hand, sought to protect infants against IDA before it occurred. Two systematic reviews evaluated interventions to prevent or control anemia in 6–23-month-old infants, and interventions in these reviews included iron supplementation, iron fortification of milk or cereals, multiple micronutrient powder, and fortification of complementary foods at home. The results showed that these interventions reduced the risk of anemia but the progress was slow and did not meet national targets for preventing IDA (2,5).

Studies from Turkey reported a minimum IDA prevalence of 16.5% (20) and a maximum prevalence of 39% among infants (21) (6,20-22), whereas studies on infants from other countries found that the prevalence of IDA ranged from 27.33% (4) to 57.7% (9) (3,4,9,12,23,24). In the present study, on the other hand, the prevalence of IDA was 58% on average, with a lower prevalence in the intervention group (Table 2). The WHO reported that a prevalence of 5% for anemia in a country is normal, a rate between 5% and 19% indicates a mild public health concern, a rate between 20% and 39% indicates a moderate concern, and a rate of 40% shows a severe public health concern (1,22). According to this classification, the rates found in the present study shows that IDA is a severe public health concern and requires immediate intervention for protecting the health of infants. Indeed, IDA has serious negative effects on the physical and psychological development of infants during the most pronounced period of postnatal development and affects all body functions (2,4,6-9,12,13).

Meta-analyses that looked into the effects of home visits by nurses on infant outcomes showed that home visits by nurses increased the rate and duration of breastfeeding in infants, had a positive effect on infant weight, and improved infant nutrition (15,29). However, the present study is the only study that shows that home visits by nurses help prevent IDA in 9-month-old infants.

In the present study, infants were visited at home three times, once a month. Two meta-analyses on this subject found no significant difference between more than three visits and three or fewer home visits and showed that home visits led to an outcome which was at least twice better than that of the control group (2,25). This study involved a total of 100 infants, 50 in the intervention group and 50 in the control group. A meta-analysis reported that research with sample sizes ≤100 people tend to have higher effect sizes (15). Continuing home visits allow for observing and assessing changes that have occurred after the previous visit, thereby facilitating accurate identification of health problems relating to the individual, family, and environment and offering realistic solutions to the identified problems (2,25).

In our study, the rate of infants with a daytime breastfeeding frequency of more than seven sessions was higher in the intervention group compared with the control group (Table 4.2; $p < 0.05$). Thus, infants in the intervention group received more breast milk, which demonstrated the effectiveness of the trainings

and interventions provided during home visits. Studies show that a longer-term breastfeeding can protect infants from anemia and lower the incidence of IDA (6,7,14,22). Indeed, iron absorption rate is approximately 10% for cow's milk and 50% for breast milk (6,7,14,22).

One of the factors affecting the occurrence of IDA in infants is the content of complementary foods. In our study, analyses during the third visit showed that almost all of the infants in the intervention group received all food groups (98%), with a lower rate in the control group (78%). (Table 1; $p < 0.05$). In the present study, an important point that was highlighted by the researchers during home visits was the fact that breast milk and complementary foods should not be given together because supplementary foods given with breast milk reduce the absorption of iron in breast milk. If breastfed infants are to be started on complementary feeding, breast milk and complementary foods should be given as separate meals (6,7,14,22). Consequently, the researchers observed that 18 (36%) mothers in the intervention group believed that complementary foods did not satiate their babies, and they breastfed their babies immediately after a complementary meal. Thus, to correct this error, the researchers provided necessary education and demonstrated correct practices to the mothers to separate the timing of breast milk and complementary feeding.

Another factor affecting IDA is iron supplementation. In the present study, all of the mothers in the intervention group stated that they regularly used iron for the infants, while this rate was lower in the control group (Table 1; $p < 0.05$). Iron supplementation is often used in developing countries to control iron deficiency. The WHO recommends iron supplementation in countries with a high prevalence of anemia (40%). Compliance is the major problem in iron supplementation programs (21,22). In our study, in trying to address the problem of compliance and ensure regular use of iron supplementation, the researchers used home visits as an opportunity to thoroughly inform the families and this improved compliance with iron supplementation.

Strengths and Limitations

This study possesses several strengths and limitations. The strengths of this study include its large sample size, significant power, and experimental and controlled design. An additional strength is the nature of the home visits: data collection was based on the declarations of the caretaker and observations made by the researcher, which allowed gathering reliable information. However, the study has some limitations; the study involved a group of infants registered in a single district, and the socio-economic and socio-cultural status of the infants do not represent infants in the entire country.

CONCLUSIONS

This study offers promising initial evidence that nurse-conducted home visits for 6-month-old infants over a 3-month period may provide protection against or reduce IDA. Given the high risk of IDA for infants both globally and in our country, there is a strong need for new approaches to improve the developmental outcomes of these infants. Home visits should be encouraged to ensure comprehensive preventive health services. It is important to plan new studies to make home visits gain importance again and to inform nurses and raise their awareness. Because IDA remains an important pediatric health problem, it is recommended that necessary precautions should be taken, nutrition should be regulated, prophylactic iron use should be promoted between the first 4–12 months of life and awareness of nurses should be raised. Further research on infant checkups through home visits should be conducted with infants from different regions. The results of the present study demonstrate that home visiting is a valid way to promote safe transitions of care for mothers and their newborns, while maintaining high-quality person-centered outcomes. Particularly, home visits enable collaborative relationships between public health nurses and community services to identify realistic needs and thus support seamless continuity of care. This study of home visiting practices covers all areas of preventive care recommended by the WHO and recent research.

DESCRIPTIONS

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Ethics Statement: Ethics committee approval was obtained from the Noninvasive Clinic Ethical Committee of the Medical Faculty at Harran University. The registration number and name of the trial registry are provided at the of the article methods.

Patient Consent Statement: The study was conducted in accordance with the Declaration of Helsinki and informed consent was obtained from all participants.

Data Availability Statement: The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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