Scientific Foundation SPIROSKI, Skopje, Republic of Macedonia
Open Access Macedonian Journal of Medical Sciences. 2022 Jul 02; 10(E):1434-1439.
https://doi.org/10.3889/oamjms.2022.7017
eISSN: 1857-9655
Category: *E - Public Health*
Section: *Public Health Education and Training*

Since 2002

OPEN ACCESS

Nutritional Education to the Nutritional Maternal Knowledge and Iron Intake among Toddlers with Anemia

Suryana Suryana[1]*, Yulia Fitri[1], Andi Eka Yunianto[2], Bustami Bustami[3], Sanya Anda Lusiana[4]

[1]Department of Nutrition, Health Polytechnic of Aceh (Poltekkes Kemenkes Aceh), Banda Aceh, Indonesia; [2]Departement of Nutrition, Siliwangi University, Tasikmalaya, Indonesia; [3]Department of Informatics, Universitas Malikussaleh, Lhokseumawe, Aceh, Indonesi; [4]Department of Nutrition, Health Polytechnic, Ministry of Health, Jayapura, Indonesia

Edited by: Sasho Stoleski
Citation: Suryana S, Fitri Y, Yunianto AE, Bustami B, Lusiana SA. Nutritional Education to the Nutritional Maternal Knowledge and Iron Intake among Toddlers with Anemia. OpenAccessMacedJMedSci.2022Jul02;10(E):1434-1439. https://doi.org/10.3889/oamjms.2022.7017
Keywords: Anemia; Nutrition counseling; Toddlers; Maternal knowledge
***Correspondence:** Suryana Suryana, Department of Nutrition, Health Polytechnic of Aceh (Poltekkes Kemenkes Aceh), Banda Aceh, Indonesia. E-mail: bundanafisgibran@gmail.com
Received: 06-Aug-2021
Revised: 20-Jun-2022
Accepted: 23-Jun-2022
Copyright: © 2022 Suryana Suryana, Yulia Fitri, Andi Eka Yunianto, Bustami Bustami, Sanya Anda Lusiana
Funding: This research did not receive any financial support
Competing Interests: The authors have declared that no competing interests exist
Open Access: This is an open-access article distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (CC BY-NC 4.0)

Abstract

BACKGROUND: In general, maternal knowledge about nutrition and health affects food habits, influencing the child's nutritional or iron intake. One effort to improve children's iron status is by providing maternal nutrition education.

AIM: The purpose of this study was to analyze the effect of a nutrition education intervention on maternal knowledge and toddlers' iron intake to prevent anemia among children under five. Paired t-test was used to analyze differences in knowledge, nutrient intake, consumption of iron sources, and hemoglobin (Hb) status of children before and after nutrition education interventions.

METHODS: This study was a Quasi Experiment with a one-group pre-posttest design. The subjects of this study were 40 toddlers consisting of two groups, namely, 20 toddlers in the intervention group and 20 toddlers in the control group. Mother's knowledge about anemia, while nutrient intake, food sources containing iron were analyzed using Paired T-test.

RESULTS: The results of this study indicated a significant effect of a nutrition education intervention on improvement of maternal knowledge ($p = 0.000$), energy intake ($p = 0.001$), carbohydrates ($p = 0.038$), fat (0.047), iron (0.031), and consumption of iron food sources including chicken ($p = 0.000$) and fish ($p = 0.005$). However, no significant effect was identified on the Hb level of toddlers ($p = 0.66$).

CONCLUSION: Nutrition education intervention significantly affected the mother's knowledge and toddlers' iron intake but did not affect the Hb levels of toddlers.

Introduction

Anemia contributes to morbidity and mortality, impaired neurological development, and decreased work productivity that affects one-third of the world's population [1]. Anemia is a condition when the production of red blood cells is low, or the concentration of blood carriers in the form of hemoglobin (Hb) is not sufficient for the body's physiological needs [2]. Common anemia is caused by iron deficiency [3]. Iron is needed to form Hb, which transports oxygen from the lungs through the bloodstream to the brain and is then distributed to all organs or body tissues [4], [5]. Anemia can occur in all life cycles but is more common at certain ages, such as pregnant women and children [1].

Iron deficiency anemia in children is believed to be the most common public health problem of micronutrient deficiency worldwide [6]. Anemia is the second leading cause of disability globally, affecting more than half of preschool children in developing countries and at least 30–40% in industrialized countries [7]. The prevalence of anemia in children under five in Indonesia is still relatively high. The behavior of parents in preventing anemia in children is still lacking. Anemia in children under five is currently one of the nutritional and public health problems in Indonesia. The prevalence of anemia under five in several regions in Indonesia is higher than the prevalence of anemia in the National. Aceh is one of the provinces with anemia prevalence under five above the national, of 67.8% [4].

Research conducted in the Darul Imarah Sub-district, Aceh Besar, shows children with Hb levels <11 g/L of 68.6% [8]. The prevalence of anemia is a public health problem in the severe category, with a prevalence of 40% [9]. One of the causes of anemia in children under five is the mother's level of knowledge. Mother's knowledge plays an important role in child feeding practices. The previous studies found that low maternal knowledge was a factor causing anemia in children; low maternal knowledge affected poor child feeding due to anemia [10]. Their knowledge about the nutritional needs of children can be obtained through nutrition education programs. Nutrition education is an effective and appropriate approach in fighting anemia in children in a sustainable manner [11]. Nutrition education will increase mother's knowledge through parenting practices through feeding, which impacts the

intake of iron-rich foods in children under five with iron deficiency anemia [12].

Mother's knowledge about child feeding can be increased through outreach programs at integrated health post services (in Indonesian is Pos Pelayanan Terpadu, abbreviated as Posyandu). However, nutrition counseling at the Posyandu, especially in the Aceh Besar District, has not been carried out properly, besides the low quality of cadres due to the lack of training and their low education level [13]. One of the implementations of the Information Communication and Education program at the posyandu is nutrition education interventions given to cadres and mothers of toddlers to improve knowledge, attitudes, and skills. At present, there is no IEC specifically discussing problems and prevention and the skills of mothers in processing complementary breastfeeding to increase Hb levels so that toddlers do not become anemic. This study aimed to analyze the effect of nutrition education interventions on maternal knowledge and toddlers' iron intake to prevent anemia in children under five in Simpang Tiga Sub-district, Aceh Besar District.

Methods

Study design and participants' characteristics

The study was conducted in Batee Linteung Village and Tantuha Village in Simpang Tiga Sub-district in Aceh Besar District during November-December 2020. This study was a Quasi Experiment with a one-group pre-posttest design, where the research design was compared before and after intervention (nutrition education by counseling).

The minimum sample size used in the study was obtained using the Lemeshow *et al*. (1997) as follows:

$$n => 2 \times SD^2 \times \left(Z\beta + Z\alpha\right)^2 / \delta^2$$

Information:

n: Number of samples per treatment group

SD: Standard deviation of Hb in research conducted by Suryana 2016 [8] is 10 g/L

Zβ: 95% confidence interval (1.96)

Zα: 80% power (0.84%)

δ: Difference in Hb (7.1)

Based on the formula obtained, the number of children under five or samples in this study who will be given treatment is 20 people. Respondents in this study were mothers of children under five. Nutrition education interventions will be given to selected mothers of children under five. Respondents in this study were mothers of children under five who were willing to participate in this research activity entirely until the end of the study. The sample was children under five aged 2–5 years, with several criteria, that is, not in illness, had permission from their parents for Hb measurement.

Data retrieval

This study consisted of five stages, including filling out informed consent, pre-test/baseline (measurement of mother's knowledge, toddler's Hb levels, toddler's food consumption habits, and nutrient intake), intervention I (nutrition counseling), intervention II (nutritional counseling), and post-test (measurement of mother's knowledge, toddler's Hb levels, toddler's food consumption habits, and nutrient intake). The first intervention material included prenatal and postnatal nutrition, the definition of anemia, diagnosis of anemia, factors causing anemia, sources of heme and non-heme iron, foods and nutrients that interfere with and promote Fe absorption, and the impact of anemia on toddlers. The 2nd intervention materials included food sources high in nutrients and processing high iron content of complementary breastfeeding. The intervention process was carried out for 8 weeks. Baseline data was carried out in the 1st week before the intervention was given conducted in the 1st week, the 2nd intervention was conducted in the 5th week, and the post-test at the 8th week. The intervention was given through the counseling method using brochures and leaflets.

The type of data collected was the socioeconomic characteristics of the family, the characteristics of the sample, maternal nutritional knowledge about anemia, and the child's Hb level. The data on the family's socioeconomic characteristics, the characteristics of the children, and the mother's knowledge were collected through interviews using a questionnaire. Toddlers' food consumption data were collected by interview using the Food Frequency Questioner and Food Recall 1 × 24 h questionnaire. Data on children's Hb levels were measured using a Dr. Family device with capillary blood sampling.

Data analysis

The data were processed and analyzed descriptively and inferentially using Microsoft Excel 2007 and SPSS 16.0 for Windows. Before analyzing the data on SPSS, the data normality test was first carried out. Mother's knowledge about anemia, while nutrient intake, food sources containing iron were analyzed using Paired t-test to see the difference before and before being given nutrition education.

Ethical approval

This research had ethical approval from the

Health Research Ethics Commission of the Mataram Health Polytechnic with Number: LB.01.03/6/5456/2020. Before collecting data, the researcher explained the purpose of the research. After the subject understood the explanation, the respondent signed informed consent to become a research subject. Confidentiality was given in its entirety at each stage of the research.

Results

Sample characteristics

The characteristics of the sample in this study consisted of the age and sex of the toddler. Nutrition education intervention to increase Hb levels in children under five was conducted on 20 children under five in Batee Linteung Village, Tantuha Village, Simpang Tiga, Aceh Besar District. The sample in this study was children aged 12–59 months; most toddlers were 37–59 months old (50.0%), then 12–24 months old (30.0%), and 25–26 months old (20.0%). Based on gender, the sample was primarily male of 12 toddlers (60.0%), while females were 8 toddlers (40.0%). Based on low birth weight (LBW) status, more than half samples were not LBW (65.0%) and LBW (35.0%). An overview of the characteristics of the sample is presented in Table 1.

Table 1: Distribution of toddler characteristics

Sample characteristics	*n*	%
Toddler Age (m.o)		
12–24	6	30.0
25–36	4	20.0
37–59	10	50.0
Gender		
Male	12	60.0
Female	8	40,0
Low birth weight status		
LBW (< 2500 g)	7	35.0
Non LBW (>2500 g)	13	65.0

Household socioeconomic characteristics

The socioeconomic characteristics of the household in this study included maternal's age, education, occupation, and family income. Based on Table 2, it can be seen that more than half the proportion of mothers was more than 33 years old (60%), and under 28 years old was 25.0%. They mainly were unemployed (housewife) of 35.0%, followed by farmers (30.0%), civil servants (20.0%), and traders (15.0%). Most of the farmers in this study worked in their fields and worked in other people's fields to earn wages. Most of the respondents graduated from high school (50.0%), and the same percentage of respondents graduated from junior high school (25.0%) and university (25.0%).

Table 2: Distribution of household socioeconomic characteristics

Maternal characteristics	n	%
Age (year)		
< 25	1	5.0
25–28	5	25.0
29–32	2	10.0
≥33	12	60.0
Occupation		
Farmer	6	30.0
Trader	3	15.0
Civil servant	4	20.0
Housewife	7	35.0
Education		
Junior high school	5	25.0
Senior high school	10	50.0
University	5	25.0
Monthly income		
Low	9	45.0
High	11	55.0

Maternal knowledge on anemia before and after intervention

There were 20 question items in the measurement of nutritional knowledge in this study. In general, it can be seen that there was a change in the improvement of maternal knowledge on all items of knowledge (Table 3). Maternal knowledge became adequate after being nutritional counseling. However, several questions were still low, namely, on the source of heme iron, nutrients that increase Fe absorption, the impact of anemia in children, anemia prevention in children, Vitamin C adequacy, and LBW definition.

Table 3: Distribution of maternal nutrition knowledge each item with correct answers

Nutritional knowledge	Pre-test (n-20)		Post-test (n-20)	
	n	%	n	%
Complementary breastfeeding introduction age	14	70	19	95
Family feeding introduction age	8	40	16	80
Definition of anemia	3	15	12	60
Symptoms of anemia	6	30	14	70
Causes of lack of Hb/anemia	10	50	13	64
Heme iron source	5	25	11	55
Non-hame iron source	8	40	14	70
Fruits and vegetables are a source of micro minerals	10	50	16	80
Foodstuffs reduce the Fe absorption	8	40	13	65
Nutrients increase Fe absorption	6	30	11	55
The impact of anemia on children	11	55	10	50
How to prevent anemia	8	40	9	45
Child development time	12	60	13	65
Fe adequacy in toddlers	3	15	12	60
Adequacy of vitamin C in toddlers	4	20	11	55
Low birth weight is the birth weight of the baby	6	30	11	55
Example Menu with high Fe	10	50	15	75
Food sources of Vitamin C	15	75	19	95
Food sources of Vitamin A	11	55	19	95
balanced nutrition of complementary breastfeeding	8	40	15	75

Table 4 presents respondents' knowledge before and after obtaining nutritional counseling. Before the intervention was given, mostly the respondents (90.0%) had low nutritional knowledge (36.0% out of 100%). Nevertheless, 60.0 respondents had an average score that became quite good after the intervention or in the moderate category (68.3% out of 100%). There was an increase in the score before and after significantly ($p < 0.05$) by 32.3%. This indicated that the intervention provided could increase the nutritional knowledge of respondents/mothers of children under five about anemia and processing foods high in iron sources.

Table 4: Distribution of mother's nutritional knowledge about anemia

Knowledge	Pre-test mean ± SD	Post-test mean ± SD	p-value
mother's nutritional knowledge	7.55 ± 3.34	13.65 ± 3.84	0.000

*Significance of p < 0.05 with different paired t-test, SD: Standard deviation.

Toddler food consumption

Table 5 shows an increase in energy, fat, carbohydrates, and iron intake in children under five after the nutritional counseling intervention. This is indicated by the results of the t-test analysis with a p < 0.05. The test results also showed that the nutritional education given by the counseling method had a significant effect in improving the intake of energy, fat, carbohydrates, and iron in the sample. In addition, it can be seen that the overall energy and nutrient intake in this study increased after being given nutrition education intervention with counseling. However, some intakes, such as Vitamin C and zinc, decreased after nutritional counseling.

Table 5: The average intake of energy and nutrients

Nutrient intake	Pre-test	Post-test	p-value
	Mean ± SD	Mean ± SD	
Energy	971.9 ± 111.20	1029.2 ± 71.07	0.001*
Carbohydrate	123.2 ± 32.78	138.4 ± 37.63	0.038*
Protein	24.8 ± 9.48	26.6 ± 8.19	0.193
Fat	136.0 ± 209.95	378.0 ± 6.40	0.047*
Vitamin A	980.0 ± 387.43	1725.0 ± 294.76	0.279
Vitamin C	36.7 ± 25.88	35.8 ± 17.18	0.789
Calcium	536.7 ± 495.03	622.3 ± 380.09	0.270
Zinc	5.2 ± 5.21	3.8 ± 1.00	0.228
Iron	3.3 ± 17.72	7.5 ± 3.72	0.031*

*Significance p < 0.05 with different paired t-test, SD: Standard deviation.

There was a difference between energy intake between the post-test and pre-test, and the carbohydrate intake at the time of the pre-test was 123.22 compared to the post-test was 138.4. Protein intake during the pre-test was 24.82 compared to the post-test was 26.65. Fat intake during the pre-test was 136.04 compared to the post-test was 37.8. The intake of Vitamin A during the pre-test was 980.04 compared to the post-test was 1725.0. Vitamin C intake at the time of pre-test was 36.68 and in the post-test was 35.81. Calcium intake at the pre-test was 536.75 compared to the post-test was 622.3. Zinc intake at the time of the pre-test was 5.2 compared to the post-test was 3.80. Zinc intake during the pre-test was 7.0 compared to the post-test was 3.26. Meanwhile, the iron intake in the pre-test was 3.3 become 7.5 in the post-test. Furthermore, the influence of nutritional counseling was indicated in improving all nutrients intake from pre-test to post-test. At the same time, the significance detected on energy, carbohydrate, fat, and iron was found significant (p < 0.05).

Table 6: Consumption of Iron food sources

Fe food source	Pre-test	Post-test	p-value
	Mean ± SD	Mean ± SD	
Chicken meat (g/week)	113.75 ± 52.59	136.95 ± 48.99	0.000*
Beef/Lamb (g/week)	62.8 ± 15.58	62.65 ± 15.83	0.974
Liver (g/week)	27.20 ± 21.55	35.35 ± 28.66	0.222
Fish (g/week)	230.50 ± 71.80	285.50 ± 79.92	0.005*
Shrimp, Squid, Shell (g/week)	29.75 ± 20.99	39.20 ± 19.56	0.171
Egg (g/week)	360.0 ± 99.47	387.50 ± 101.14	0.264
Milk (g/week)	667.50 ± 312.57	667.50 ± 312.57	0.120

*Significance of p < 0.05 with different test paired t-test, SD: Standard deviation.

Based on Table 6, it was known that the 20 samples in the pre-test consumed chicken of 113.75 g/week than the post-test of 136.95 h/week, with a p-value of 0.000. Those who consumed beef/lamb meat at the pre-test was 62.8 g/week compared to the post-test of 62.65 g/week. In the pre-test, they also consumed fish was 230.50 g/week and in the post-test was 285.50 g/week, with a p-value of 0.005. Besides, there was consumption of shrimp/squid/shell at the pre-test of 29.75 g/week than the post-test was 39.20 g/week. The milk was also consumed for about 667.50 g/week in the pre-test and 667.50 g/week in the post-test. Statistically, there was a significant difference in chicken and fish consumption (p < 0.05) indicated an influence of nutritional.

Hb level of toddlers

Table 7 shows data on Hb levels and anemia status of children under five before and after their mother receiving nutrition education interventions with counseling. The different test results with paired t-test showed that the Hb levels of children under five were not significantly different (p = 0.66) after nutrition counseling intervention. Anemia status categorized based on Hb levels showed that children under five from mothers who received the intervention were higher (50.0%) than after the intervention (45.0). There was a change in one sample of anemic toddlers to non-anemic after the mother received the intervention.

Table 7: Anemic status among toddlers

Anemic status	Pre-test	Post-test	p-value
Hemoglobin	92.30 ± 37.28	104.30 ± 24.73	0.138

*Significance of p < 0.05 with different test Paired t-test.

Discussion

Iron is an important mineral for the human body because it helps in various metabolic processes, including oxygen transport, deoxyribonucleic acid synthesis, and electron transport [14]. The prevalence of anemia in children under five worldwide is relatively high, which is around 24.8%. Iron deficiency anemia often occurs in infants associated with low levels of several functions such as: Sensory, motor, cognitive, language, and socio-emotional [15]. Anemia during infancy is associated with poor health and developmental disorders, resulting in decreased academic achievement and earning potential in adult life. Anemia in infancy can lead to poor health and developmental status and increase the risk of mortality and morbidity [16], [17].

The low level of maternal education affects maternal nutrition knowledge, which may impact one of the risk factors for anemia in children [18]. Nutrition education is one of the fundamental steps in overcoming the problem of anemia in children under five. Nutrition education is

given to toddlers who provide parenting to their children every day [11]. Mother's education is a strong predictor that affects the nutritional status of children under five [19]. The previous research has shown that high nutrition education impacts increasing Hb levels in the blood, reducing the risk of anemia in children under five [20]. The mother's education level will affect the mother's level of knowledge about nutrition in child feeding practices [10].

The mother's knowledge about nutrition and health in the study was obtained from their ability to answer the question. It was known that the knowledge of mothers before and after the intervention experienced a significant increase. Mothers are parents who are more involved in the upbringing of children. Parenting applied by mothers to children varies between families. Mother's knowledge is an important basis for adequate nutritional intake of children [19]. Nutrition knowledge implemented in attitudes and practices will encourage a good eating pattern in the household [21].

Mother's knowledge in this study showed a significant effect on increasing intake of macronutrients such as energy, carbohydrates, and fats. In addition, there was an increase in the intake of micronutrients, especially iron. The previous studies have shown that maternal education interventions significantly increase macronutrients and micronutrients, especially iron intake. This is following previous research, which showed that increased maternal nutrition knowledge would improve children's nutrient intake [11]. Nutrition education interventions impact the process of serving children's food and are also influenced by nutrient intake, both macronutrients, and micronutrients [22]. A higher level of mother's knowledge has a significant positive relationship with the nutritional status of children under five [23].

Daily food consumption determines the fulfillment of a child's nutritional needs. Nutritional adequacy is a description of the number of nutrients needed by individuals. Adequacy of nutrients is the amount of each nutrient that must be met from food. Animal source foods are sources of important micronutrients, especially iron, in varying amounts [24]. Child feeding is closely related to parenting, especially mothers. Parental feeding of children is at the core of the fabric of family life and is deeply rooted in culture and tradition [25]. Children often consume animal foods to increase their iron status, mainly chicken and fish. Chicken and fish are sources of iron which is influenced by the red pigment, namely Hb. Chicken is a source of minerals such as iron, zinc, and copper [26]. The previous studies consuming chicken twice can increase serum ferritin [27]. Another source of iron is found in fish in the form of haem, and fish have a high iron content depending on the type of fish and the color of the fish flesh [24], [28]. The previous studies conducted in India showed that frequent fish consumption could increase Hb levels in the blood in children [29].

Nutrition education in this study showed no significant difference between the provision of nutrition education and the anemia status of children under five. However, based on the average, there was still an increase in Hb levels before and after the nutrition education intervention. This is different from previous studies, which showed that nutrition education had a significant effect on increasing the Hb level of children under five. Nutrition education is one of the programs to overcome micronutrition issues, namely iron deficiency anemia that occurs in society in general. Nutrition education has a vital role in increasing the knowledge and attitudes of mothers in providing good parenting to their children. The author realizes the lack of this study; the intervention was only for 8 weeks or 56 days. The increase in Hb levels in toddlers was not too significant. The previous studies showed that the formation of Hb in the blood occurs for 120 days [14], [30].

Conclusion

This study shows a significant effect of providing nutrition education on increasing maternal knowledge, influenced by elevated nutrients intakes, such as energy, carbohydrates, and fats. In addition, the intake of micronutrients, especially iron, was also significantly increased. Nutrition education interventions also affected the improvement of iron-rich animal foods intake, including chicken and fish. However, the results of this study had not shown a positive impact in improving the Hb level status of children. The authors suggest that the policymaker (office of health district) is expected to be able to make a screening program to detect anemia in under five children to detect its risk factors early. This early detection can be used as preventive action. Providing knowledge related to anemia and its preventive method to under five children's mothers, such as additional feeding intervention, providing iron rich foods especially from animal source, dark green vegetables, and Vitamin C rich fruits also can help to improve their anemic condition.

References

1. Chaparro CM, Suchdev PS. Anemia epidemiology, pathophysiology, and etiology in low and middle-income countries. Ann N Y Acad Sci. 2019;1450(1):15-31. https://doi.org/10.1111/nyas.14092
   PMid:31008520
2. Giger U. Anemia. In: Small Animal Critical Care Medicine. Amsterdam, Netherlands: Elsevier; 2009.
3. Miller JL. Iron deficiency anemia: A common and curable disease. Cold Spring Harb Perspect Med. 2013;3(7):a011866. https://doi.org/10.1101/cshperspect.a011866
   PMid:23613366
4. Premont RT, Reynolds JD, Zhang R, Stamler JS. Role of nitric oxide carried by hemoglobin in cardiovascular physiology: Developments on a three-gas respiratory cycle. Circ Res. 2020;126(1):129-58.

https://doi.org/10.1161/CIRCRESAHA.119.315626
PMid:31590598

5. Iswati RS, Ayu D, Rosyida C. Relationship between Nutritional Status and the Incidence of Anemia among Children Aged 6 Months 3 Years. 1st International Conference Health Science Technology; 2019. p. 56-8.
6. Habib MA, Black K, Soofi SB, Hussain I, Bhatti Z, Bhutta ZA, *et al*. Prevalence and predictors of iron deficiency anemia in children under five years of age in Pakistan, a secondary analysis of national nutrition survey data 2011-2012. PLoS One. 2016;11(5):e0155051. https://doi.org/10.1371/journal.pone.0155051
PMid:27171139
7. Anokye R, Acheampong E, Edusei AK, Mprah WK, Ofori-Amoah J, Amoah VM, *et al*. Perception of childhood anaemia among mothers in Kumasi: A quantitative approach. Ital J Pediatr. 2018;44(1):142. https://doi.org/10.1186/s13052-018-0588-4
PMid:30477586
8. Suryana, Madanijah S, Sukandar D. Prevalence and factors associated with anemia in children aged 12-24 months in Darul Imarah sub-district Aceh Besar District. Pak J Nutr. 2016;15(8):708-14. https://doi.org/10.3923/pjn.2016.708.714
9. World Health Organization. Worldwide Prevalence of Anaemia 199-2005. WHO Global Database on Anemia. Geneva: World Health Organization; 2008.
10. Ngimbudzi EB, Lukumay AM, Muriithi AW, Dhamani K, Petrucka P. Mothers' knowledge, beliefs, and practices on causes and prevention of anaemia in children aged 6-59 months: A case study at Mkuranga district hospital, Tanzania. Open J Nurs. 2016;6(4):342-52. https://doi.org/10.4236/ojn.2016.64036
11. Metwally AM, Hanna C, Galal YS, Saleh RM, Ibrahim NA, Labib NA. Impact of nutritional health education on knowledge and practices of mothers of anemic children in Elothmanyia village Egypt. Open Access Maced J Med Sci. 2020;8(E):458-65. https://doi.org/10.3889/oamjms.2020.4570
12. Akalu Y, Yeshaw Y, Tesema GA, Demissie GD, Molla MD, Muche A, *et al*. Iron-rich food consumption and associated factors among children aged 6-23 months in Sub-Saharan Africa: A multilevel analysis of demographic and health surveys. PLoS One. 2021;16(6):e0253221. https://doi.org/10.1371/journal.pone.0253221
PMid:34138916
13. Darmawati D, Siregar TN, Kamil H, Tahlil T. Barriers to health workers in iron deficiency anemia prevention among Indonesian pregnant women. Anemia. 2020;2020:8597174. https://doi.org/10.1155/2020/8597174
PMid:33489369
14. Abbaspour N, Hurrell R, Kelishadi R. Review on iron and its importance for human health. J Res Med Sci. 2014;19(2):164-74.
PMid:24778671
15. Li Q, Liang F, Liang W, Shi W, Han Y. Prevalence of anemia and its associated risk factors among 6-months-old infants in Beijing. Front Pediatr. 2019;7:286. https://doi.org/10.3389/fped.2019.00286
PMid:31355169
16. Woldie H, Kebede Y, Tariku A. Factors associated with anemia among children aged 6-23 months attending growth monitoring at Tsitsika health center, Wag-Himra zone, Northeast Ethiopia. J Nutr Metab. 2015;2015(10):928632. https://doi.org/10.1155/2015/928632
PMid:26106486
17. Suryana, Madanijah S, Sukandar D, Fitri Y, Ahmad A. Assessment of anemia status on physical development skills of children under two years old in Aceh, Indonesia. J Nutr Sci Vitaminol (Tokyo). 2020;66(Supplement):S463-7. https://doi.org/10.3177/jnsv.66.S463
PMid:33612642
18. Orsango AZ, Habtu W, Lejisa T, Loha E, Lindtjørn B, Engebretsen IM. Iron deficiency anemia among children aged 2-5 years in southern Ethiopia: A community-based cross-sectional study. PeerJ. 2021;9:e11649. https://doi.org/10.7717/peerj.11649
PMid:34249504
19. Abuya BA, Ciera J, Kimani-Murage E. Effect of mother's education on child's nutritional status in the slums of Nairobi. BMC Pediatr. 2012;12:80. https://doi.org/10.1186/1471-2431-12-80
PMid:22721431
20. Al-Suhiemat AA, Shudifat RM, Obeidat H. Maternal level of education and nutritional practices regarding iron deficiency anemia among preschoolers in Jordan. J Pediatr Nurs. 2020;55(2):e313-9. https://doi.org/10.1016/j.pedn.2020.08.019
PMid:32933806
21. Savage JS, Fisher JO, Birch LL. Parental infulence on eating behavior. J Law Med Ethics. 2007;35(1):22-34. https://doi.org/10.1111/j.1748-720X.2007.00111.x
PMid:17341215
22. Darawati M, Yunianto AE, Sulendri NK, Omdah. Stunting prevention through participative counselling on the implementation of balanced nutrition toward children by involving local puppeteers in central Lombok regency, West Nusa Tenggara. Syst Rev Pharm. 2020;11(11):805-10.
23. Fadare O, Amare M, Mavrotas G, Akerele D, Ogunniyi A. Mother's nutrition-related knowledge and child nutrition outcomes: Empirical evidence from Nigeria. PLoS One. 2019;14(2):e0212775. https://doi.org/10.1371/journal.pone.0212775
PMid:30817794
24. Perera G, Gunawardana D, Jayatissa R, Silva AB, Buddhika A, Jayatissa R. Iron content of some popular cooked foods consumed by the rural school children in Sri Lanka. J Food Qual. 2019;2019:6972745. https://doi.org/10.1155/2019/6972745
25. Daniels LA. Feeding practices and parenting: A pathway to child health and family happiness. Ann Nutr Metab. 2019;74(Suppl 2):29-42. https://doi.org/10.1159/000499145
PMid:31234189
26. Marangoni F, Corsello G, Cricelli C, Ferrara N, Ghiselli A, Lucchin L, *et al*. Role of poultry meat in a balanced diet aimed at maintaining health and wellbeing: An Italian consensus document. Food Nutr Res. 2015;59:27606. https://doi.org/10.3402/fnr.v59.27606
PMid:26065493
27. Moshe G, Amitai Y, Korchia G, Korchia L, Tenenbaum A, Rosenblum J, *et al*. Anemia and iron deficiency in children. J Pediatr Gastroenterol Nutr. 2013;57(6):722-7. https://doi.org/10.1097/MPG.0b013e3182a80c42
PMid:24280989
28. Wheal MS, Decourcy-Ireland E, Bogard JR, Thilsted SH, Stangoulis JC. Measurement of haem and total iron in fish, shrimp and prawn using ICP-MS: Implications for dietary iron intake calculations. Food Chem. 2016;201:222-9. https://doi.org/10.1016/j.foodchem.2016.01.080
PMid:26868569
29. Nguyen PH, Scott S, Avula R, Tran LM, Menon P. Trends and drivers of change in the prevalence of anaemia among 1 million women and children in India, 2006 to 2016. BMJ Glob Health. 2018;3(5):e001010. https://doi.org/10.1136/bmjgh-2018-001010
PMid:30397516
30. Waldvogel-Abramowski S, Waeber G, Gassner C, Buser A, Frey BM, Favrat B, *et al*. Physiology of iron metabolism. Transfus Med Hemother. 2014;41(3):213-21. https://doi.org/10.1159/000362888
PMid:25053935