Health Sciences & Disease
The Journal of Medicine and Biomedical Sciences

Article Original

Communicating with Parents about Nutrition: Effect on Hemoglobin Level of Children with Moderate Anemia

Éducation Nutritionnelle des Parents : Effet sur le Taux d'Hémoglobine des Enfants avec Anémie Modérée

Kamo Sélangaï Hélène [1], Nfor Nora Bih[2], Agwanande Wilson[2], Hadidjatou Inoua[2], Naiza Monono[3], Jeannette Epée Ngoué[4], Abouame Palma[1], Ngone Ines[4], Fombang Edith[2]

[1] Faculty of Medicine and Biomedical Sciences of Garoua, University of Garoua, Cameroon
[2] National School of Agroindustrial Science (Ensai) Ngaoundere, Université of Ngaoundere, Cameroon
[3]Department of Internal Medicine and Paediatrics, Faculty of Health Sciences, University of Buea, Cameroon.
[4]Faculty of Medicine and Biomedicals Sciences of Yaounde, University of Yaounde, Cameroon

Corresponding author
Kamo Sélangaï Hélène
Faculty of Medicine and Biomedicals Sciences of Garoua, University of Garoua, Cameroon
Box:317 Garoua
Email : nissilena@yahoo.ca
Tel: 237698456363

Key words: Anemia, iron deficiency, nutritional education, hemoglobin, weight.

Mots clés : Anémie, carence martiale, éducation nutritionnelle, hémoglobine, poids.

RÉSUMÉ

Background. Anemia is one of the most common nutritional deficiency disorders in the world. **Objective.** This study objectively evaluated the effect of nutritional education on the health status of children aged 6-59 months with moderate anemia. Material and methods. A total of 105 mother-child couples were worked on and were divided into two groups: group A received iron supplements and nutritional education, while group B received only iron supplements. Nutritional education was carried out based on responses given from a questionnaire. Data on biological (hemoglobin) and anthropometric (weight) parameters were collected before and after nutritional education. **Results**. The most affected age group was children between 13-24 months (41%). Males were more affected (56.2%). It was observed in the course of the study that malaria had a significant effect on anemia, with 60% of the total population suffering from malaria. Additionally, there was a significant change in group A in weight (P = 0.001) and hemoglobin (P= 0.045) after nutritional education. For group B, the change was not as significant as that of group A. **Conclusion**. Nutritional education in our series helped improve hemoglobin levels and weight in moderately anemic children. It should be considered an important element in the prevention and management of anemia.

ABSTRACT

Contexte. L'anémie est l'une des carences nutritionnelles les plus répandues dans le monde. **Objectif.** Cette étude a évalué l'effet de l'éducation nutritionnelle sur l'état de santé d'enfants âgés de 6 à 59 mois atteints d'anémie modérée. **Matériel et méthodes.** Un total de 105 couples mère-enfant ont été inclus dans l'étude et répartis en deux groupes : le groupe A a reçu des suppléments de fer et une éducation nutritionnelle, tandis que le groupe B n'a reçu que des suppléments de fer. L'éducation nutritionnelle a été dispensée en fonction des réponses données à un questionnaire. Des données sur les paramètres biologiques (hémoglobine) et anthropométriques (poids) ont été recueillies avant et après l'éducation nutritionnelle. **Résultats.** La tranche d'âge la plus touchée était celle des enfants de 13 à 24 mois (41 %). Les garçons étaient plus touchés (56,2 %). Au cours de l'étude, il a été observé que le paludisme avait un effet significatif sur l'anémie, 60 % de la population totale étant atteinte de paludisme. De plus, un changement significatif a été observé dans le groupe A en ce qui concerne le poids (P = 0,001) et l'hémoglobine (P = 0,045) après l'éducation nutritionnelle. Pour le groupe B, le changement n'était pas aussi significatif que pour le groupe A. **Conclusion.** Dans notre série, l'éducation nutritionnelle a contribué à améliorer les taux d'hémoglobine et le poids des enfants atteints d'anémie modérée. Elle devrait être considérée comme un élément important de la prévention et la prise ne charge de l'anémie.

INTRODUCTION

Iron deficiency is thought to be the most common cause of anemia globally, but other nutritional deficiencies, including folate, vitamin B12 and vitamin A, acute and chronic inflammation, parasitic infections, and inherited or acquired disorders that affect hemoglobin synthesis, red blood cell production or red blood cell survival, can also cause anemia [1]. Anemia can be classified into three main groups: mild anemia, that is, hemoglobin levels of 12 or 11 g/dl; moderate anemia, from 7-11 g/dl; and severe anemia, hemoglobin levels less than 7 g/dl [2,3]. Mild microcytic anemia may be treated presumptively with oral iron therapy in children six to 36 months of age who have risk factors for iron deficiency anemia [4]. Anemia is one of the most common nutritional deficiency disorders in the world, with an estimated prevalence of over 42.6% [5]. It is most common in low- and middle-income countries, with Southeast Asia and Sub-Saharan Africa being the most affected [6]. It can occur at all stages of the human life cycle but is more prevalent in pregnant women and

HIGHLIGHTS

What is already known on this topic
Child anemia is still frequent despite the availability of iron supplements and iron-rich food in Africa.

What question this study addressed
To assess the effect of nutritional education on hemoglobin level in children with moderate anemia.

What this study adds to our knowledge
Nutritional education in our series helped improve hemoglobin levels and weight in moderately anemic children.

How this is relevant to practice, policy or further research.
Nutritional education should be considered an important element in the prevention and management of anemia.

children less than 5 years old [7]. The reduction of anemia is a key priority of the World Health Assembly Global Nutrition Targets for 2025 [8]. However, the prevalence is still high. In Cameroon, the prevalence of anemia among children under five years of age is 57% [9]. Although the prescription of iron supplements was systematic at every discharge for anemic children and there was an abundance of iron-rich food in the region that greatly increased hemoglobin levels, the level of anemic children was still high. Due to this paradox, there is the need to search for a suitable remedy to overcome the high anemic prevalence. Hence, the general objective of this study is to increase the level of hemoglobin in children with moderate anemia through nutritional education on the importance and application of iron-rich food.

MATERIAL AND METHODS

This is an observational prospective study carried out in Cameroon at the regional hospital of Ngaoundere at the Pediatric Service within the period of 5 months from October to the month of February 2022, on children with moderate anemia.

The target population was children from 6-59 months who were suffering from moderate anemia. In the two groups the inclusion criteria were children with moderate anemia and children whose parents provided consent for the study. The exclusion criteria were children suffering from sickle cell anemia, children who received blood transfusion within the study period and people who lived out of town. Our sample size will be calculated using Lorent's formula Therefore 88 patients was the estimated number of children to be sampled for the study.

Patients were sampled, and these children were divided into two groups: group A included children who received iron supplements and nutritional counseling, while group B included children who received only iron supplements. In both groups, the data were collected using the results of their hemoglobin level in the medical booklet. The software SPHINX was used to produce the questionnaire, which was made up of four main parts: identification of the child; sociodemographic and socioeconomic characteristics of the children, that is, age and sex; and the mother's marital status, level of education, profession, marital regime and religion. Biological parameters (hemoglobin level, Hiv test, malaria infection) and anthropometric measures of the child: Weight and height before and after were taken. Sampling during the study was done as follows: After an accord from the parents, the objectives of this study were explained to them in a language they could understand best, and they were assured of the confidentiality concerning the answers obtained. This study was carried out on the mother and child couple, and a questionnaire was used to identify the child and the mother. The medical booklet of these children was collected, and from the results of the full blood count test, the hemoglobin level of the children was verified. If the hemoglobin level was between 7 and 11 g/dl, then the child's parents were called for nutritional counseling. The counseling was done individually. First, the parents were asked the kind of food they usually gave to their child, and then they were advised on the importance of local iron-rich foods and their possible effect on the hemoglobin level of the child. Images were used to show the kind of food and to make sure they knew the kind of food. They were also given counseling on the hygienic measures to be taken to avoid worm infections and mosquito bites in order to avoid malaria. At the end of the counseling, the parents were asked to summarize what was said to be sure they completely understood. After counseling the parents on what to give their children information was collected from them in order to bring out sociodemographic characteristics of the parents. Twice monthly, these parents were called in order to determine if they were still respecting the advice that was given and to remind them of the importance of the counseling on the blood level of their child. After three months, these parents were called back, and a hemoglobin test was carried out on these children to determine whether the hemoglobin level of these children had changed. Additionally, the weight of these children was taken to see if the counseling also had an effect on the weight of the child.

After obtaining all the information and results above all data was collected and recorded using a questionnaire and transferred to the Statistical Package for Social Sciences software, SPSS (Version 20.0). Pearson's Chi square or Fisher's exact tests was used to compare categorical variables. We considered p values <0.05 as statistically significant.

Ethical considerations

After the research agreement was granted by the University of Ngaoundéré, the Regional Hospital, through its ethics committee, gave authorization for data collection after the participant's informed consent. This authorization was registered under number 1714/L/RA/DRSP/HR/NGD.

RESULTS

Presentation of the study population

A total of 105 patients were sampled. These children were divided into two groups: group A consisted of children who received iron supplements and nutritional counseling, and this group was made up of 53 patients,

while group B consisted of children who received only iron supplements and was made up of 52 patients. The most affected age group was children between 13-24 months (41%), and the least affected age group was 6-9 months (9.5%). Males were more affected (56.2%), married mothers had more anemic children (84.8%), more housewives were represented (58.1%), and Muslims were the majority (56.2%) in terms of religion**.** The relationship between educational level and anemia showed that parents of children with anemia increase with decreasing levels of education, with parents who have not gone to school (39%) and those who have attained only primary school (34%) having the highest proportion of anemic cases, while the least represented were those with a superior level of education (5.7%).

Diseases encountered during the study

Approximately 63.8% of the children in this study had malaria, followed by 42.9% who had sepsis and 8.6% who had intestinal parasite infections (Table 1).

Frequency of food group consumption

From the results, 88.5% of anemic children consume cereals as the main food. Vegetable consumption was 64.3%. Although the locality is rich in vegetables that have a high iron content, such as amaranth (green leaves) and H. sabdariffa (folere) huckleberry plants, they cook some of them with limestone, which reduces the nutritional content of the plant, including the iron content. Once more, tubers (3%) are among the food groups that are least consumed. They are not a part of their cultural diet, but because they are peeled before cooking, less iron and other nutrients are present. As a result, their consumption has no impact on hemoglobin levels. Fruit consumption is 21% because parents want to buy a lot and keep it at home without proper storage. As a result, they find it time-consuming and stressful to buy fruits every day, so they only do so occasionally when they have the opportunity. Meat, fish and egg consumption was 25%. These mothers believe that parts of cows, such as the liver and intestines, are not good for children, so they never cook them, while the liver is highly rich in iron and folate, which greatly increase hemoglobin levels. Additionally, some of these food items are slightly expensive, and some of these parents are not financially stable enough to afford these iron-rich foods.

Weight variation before and after nutrition education

In group A, there was a significant increase in the weight of the children (*p* value = 0.001), with a peak increase in the weight range of 14-15.9 kg. In Group B, there was no significant weight difference (*p* value = 0.33), except for the weight range from 9-11.9 kg, which means that there was weight loss in the children of Group B.

Hemoglobin level before and after nutrition education

There was a significant increase in the level of hemoglobin in group A (*p* value = 0.001), with a percentage of 26.4% for children with hemoglobin levels between 10-11.9 g/dl to a percentage of 51% and from 0% for children with hemoglobin levels from 12-14.0 g/dl to 40%. The percentage of children who had a very low hemoglobin level decreased from 73.6% to 8.5%. In group B, there was an increase in the hemoglobin level, which was not as significant as that observed in group A (*p* value = 0.018). For hemoglobin levels from 10-11.9 g/dl, there was an increase from 38% to 59%, and for 12-14.0 g/dl, it was from 0-2%, while there was a decrease in the percentage of children with hemoglobin of 7-9.9 g/dl from 61-38%, which can be explained by the fact that the children from this group did not receive nutrition education but received iron supplements (Table 2).

DISCUSSION

The sociodemographic and socioeconomic characteristics of children, that is, age and sex, were taken. For the mothers, their marital status, level of education, profession, marital regime and religion were taken to prove that sociodemographic characteristics have an effect on the anemia state [10,11]. These characteristics have an influence on the lifestyle of the parents and children, as such will influence their food or nutrient consumption and health status in general [12].

Table 1: Diseases associated with moderate anemia

Variables		Groupe A (N=53)		Groupe B (N=52)		p value
Malaria	Negative	23	43.40	15	28.80	0.089
	Positive	30	56.60	37	71.20	
Sepsis	Yes	22	41.50	23	44.20	0.466
	No	31	58.50	29	55.80	
intestinal parasite infections	Yes	6	11.30	3	5.80	0.393
	No	47	88.70	47	90.40	

Table 2: Influence of nutritional education on weight and evolution of anemia

Parameter	Groups	Before	After	Difference (Before-After)	P value
Weight	A	11.61±0.59	13.35±0.65	1.74	P=0.001
	B	13.19± 0.61	13.36± 0.58	0.17	P= 0.33
Hemoglobin level	A	8.54±0.19	10.83±0.21	2.29	P=0.001
	B	8.73±0.16	9.88±0.13	1.15	P=0.001

There were more children in the age range of 13-24 months. while the children from 6-9 months were least represented with a percentage of 5%. This could be explained by the fact that children between 6-9 months of age still use and depend or obtain their iron from their mothers and as such do not so much depend on iron sources from food, whereas children from the age range of 13-24 months are already out of stock of the iron obtained from the mother and depend on iron from iron-rich food [13]. It is worth noting that 60% of the total population was male. The dominance of males over females could be explained by the fact that biologically, children of the male sex benefit from passive immunity (issued from the mother), which is lower than that of children of the female sex, which therefore makes them vulnerable to different infectious diseases in general [14]. There are some diseases that have been proven to have an effect on the hemoglobin level of people infected. This is generally because they can cause the destruction of red blood cells or reduce the level of iron content or iron-rich food consumption. In this view, a number of diseases were encountered, such as malaria, sepsis and parasitic infections, and their effect on anemia [15]. In our study, few patients with anemia (8.6%) had a parasitic infection, which may be because his study was based only on patients with hookworm parasites, while this study was not based on just one parasite. The feeding habit of children, starting from complementary feeding to even the culinary techniques performed on iron-rich food, reduces the level of iron in food. Additionally, there is a lack of knowledge on the nutritional values of foodstuffs, for example, not knowing that the combination of some food substances will either cause an increase in the bioavailability of iron or cause a reduction in iron bioavailability [16]. Such will either increase or decrease the iron content in the children; thus, it will have an effect on the hemoglobin level. The feeding habits of our study show that the amount of iron-rich food consumed per week has an effect on the hemoglobin level and hence anemia.

From the results, 88.5% of anemic children consume cereals as the main food, whereas cereals have low iron content, and some even contain antinutrients, which reduces the bioavailability of iron in them. Additionally, the treatment used on these cereals reduces their nutritional content; for example, maize, which is one of the most abundant cereals in the locality, is first removed, which is the part of the maize that contains most of the nutrients, including iron. Moreso, they generally prefer white maize to yellow maize, while yellow maize is richer nutritionally than white maize[17]. Another reason why cereal consumption is high is because of the culture of the locality. These cereals are always found in their daily food consumption coupled with the fact that cereals such as maize, refined rice (the brand that contains most of the nutrients is removed) and millet are very abundant and easily affordable.

Weight variation can only occur in an individual depending on what and when the individual consumes, the kind of food, and the quantity and quality of the food. It is observed that there is a significant increase in the weight of the children (p value = 0.001) with a pick increase in the weight range of 14-15.9 kg. This can be explained by the fact that since this group received nutrition education and the food they were advised to consume was moderately high in the amount of kilocalories, they were also advised to consume some food items that were not only rich in iron but also in some nutrients, such as vitamins, which stimulate appetite and not only had an effect on the hemoglobin level of the children but also had an effect on the weight of the children. There was weight loss in the children of group B. The fact that this group of children did not receive nutrition education and probably continued eating the way they did coupled with the fact that they were suffering from one infection or the other, which comes with loss of appetite, such as a reduction in the quantity of food consumption and an increase in metabolism in the body, would therefore lead to loss of weight.

Hemoglobin levels in an individual can vary depending on infections or nutritional deficiencies. Therefore, disease prevention and consumption of adequate food can be a source of anemia prevention [18]. For the hemoglobin level, there was a significant difference (p=0,001) between the hemoglobin levels, with an average hemoglobin level of 8,54±0,19 before and 10,83±0,21 after the study, with a difference of 2.29 for those of group A. The fact that this group of children are those who, coupled with the fact that they received an iron supplement, also received nutrition education on iron-rich foods and other foodstuffs, which increased the bioavailability of nonheme iron, greatly increased their hemoglobin level. For group B, there was a significant change (p=0,001), with an average hemoglobin level of 8,73±0,16 before and 9,88±0,13 after, with a difference of 1.15. Comparing the two groups of the study, it is seen that there is a highly significant change of p value less than 0.001 between the two groups after nutrition education, with an average weight of 13,35± 0,65 for group A and 13,19± 0,60 for group B, which is a difference of 0.16. There was also a highly significant change (P= 0,001), with an average hemoglobin level of 10,79±18,01 for group A and an average hemoglobin level of 9,86±4,90 for group B, representing a difference of 0.93. This significant change or increase in the hemoglobin and weight of the children after the study, especially in group A, is simply because this group, coupled with the iron supplements they received, also received nutrition education and even advice on good hygiene and how to prevent some infections that affect the hemoglobin level of children. This result is consistent with that of several authors who have shown the positive influence of nutritional education in the management of anemia. [19, 20]. According to Suter, the use of evidence-based principles of learning can contribute to the empowerment of patients as they adopt self-management skills aligned with healthy behaviors [21].

CONCLUSION

Nutritional education in our series helped improve hemoglobin levels and weight in moderately anemic children. It should be considered an important element in

the prevention and management of anemia. Education provide an opportunity to develop strategies to control the various factors associated with anemia and to improve the nutritional status of children. Nutrition education should regularly be carried out in our communities. All this should increase the awareness of mothers on the importance of nutrients and the kind of nutrients they can find in particular foods. The hemoglobin level of all the children admitted to hospitals should be taken to prevent or fight against anemia. Promote education of mothers and young girls on the importance of good nutritional practices through sensitization campaigns. Teach the mothers the importance of hygiene of the environment where they live and the food they eat. The problem of Africa in terms of nutrition is not always a problem of lack or poverty but a problem of basic knowledge.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests

Funding

This research was entirely funded by the authors

Authors' contributions

KSH: Supervision of field data collection; data analysis and interpretation
article writing and critical revision of content
FE: Supervision of field data collection; data analysis and interpretation; article writing and critical revision of content
AW: Data interpretation; article writing and critical revision of content
HI: data interpretation; article writing and critical revision of content
NNB: field data collection to data acquisition; article writing
MNI: Critical revision of content and research of journal for publication.
SS: Critical revision of content and research of journal for publication.
All authors read and approved the final manuscript.

REFERENCES

[1] Allen, L., de Benoist, B., Dary, O. and Hurrell, R., World Health Organization and Food and Agriculture Organization of the United Nations (WHO/FAO) (2006) Guidelines on Food Fortification with Micronutrients. 1-341.
[2] Cappellini MD, Motta I. Anemia in Clinical Practice-Definition and Classification: Does Hemoglobin Change With Aging? Semin Hematol. 2015 Oct;52(4):261-9. doi: 10.1053/j.seminhematol.2015.07.006. Epub 2015 Jul 17. PMID: 26404438.
[3] OMS. Hemoglobin concentrations for the diagnosis of anemia and assessment of severity. Vitamin and Mineral Nutrition Information System (VMNIS). Genève (Suisse) : OMS ; 2011. 6 p. ligne :http://apps.who.int/iris/bitstream/handle/10665/85839/WHO_NMH_NHD_MNM_11.1_eng.pdf?sequence=22
[4] Janus J, Moerschel SK. Evaluation of anemia in children. Am Fam Physician. 2010 Jun 15;81(12):1462-71. PMID: 20540485.
[5] WHO guideline on use of ferritin concentrations to assess iron status in individuals and populations. Geneva: World Health Organization; 2020. License: CC BY-NC-SA 3.0 IGO
[6] Chaparro CM, Suchdev PS. Anemia epidemiology, pathophysiology, and etiology in low- and middle-income countries. Ann N Y Acad Sci. 2019 Aug;1450(1):15-31. doi: 10.1111/nyas.14092. Epub 2019 Apr 22. PMID: 31008520; PMCID: PMC6697587.
[7] Mutonhodza B, Dembedza MP, Lark MR, Joy EJM, Manzeke-Kangara MG, Njovo H, Nyadzayo TK, Kalimbira AA, Bailey EH, Broadley MR, Matsungo TM, Chopera P. Anemia in children aged 6-59 months was significantly associated with maternal anemia status in rural Zimbabwe. Food Sci Nutr. 2022 Dec 5;11(3):1232-1246. doi: 10.1002/fsn3.3157. PMID: 36911837; PMCID: PMC10003031.
[8] World Health Organization . *Global Nutrition Targets 2025: Anemia Policy Brief*. World Health Organization; Geneva, Switzerland: 2014. [(accessed on 1Mai 2023)]. Available online: https://apps.who.int/iris/handle/10665/148556 [Google Scholar]
[9] Institut National de la Statistique (INS) et ICF. 2020. Enquête Démographique et de Santé du Cameroun 2018. Yaoundé, Cameroun et Rockville, Maryland, USA : INS et ICF.
[10] Islam GMR. Association of Socioeconomic Status With Childhood Anemia Among Infant, Toddler, and Preschool Children in Bangladesh. Value Health Reg Issues. 2020 May;21:141-148. doi: 10.1016/j.vhri.2019.09.008. Epub 2019 Dec 5. PMID: 31812112.
[11] Bishwajit G, Yaya S, Tang S, Hossain A, Fan Y, Akter M, Feng Z. Association of Living Arrangement Conditions and Socioeconomic Differentials with Anemia Status among Women in Rural Bangladesh. Biomed Res Int. 2016;2016:4571686. doi: 10.1155/2016/4571686. Epub 2016 Jul 19. PMID: 27517045; PMCID: PMC4969504.
[12] André HP, Sperandio N, Siqueira RL, Franceschini SDCC, Priore SE. Food and nutrition insecurity indicators associated with iron deficiency anemia in Brazilian children: a systematic review. Cien Saude Colet. 2018 Apr;23(4):1159-1167. English, Portuguese. doi: 10.1590/1413-81232018234.16012016. PMID: 29694583.
[13] Domellöf M, Braegger C, Campoy C, Colomb V, Decsi T, Fewtrell M, Hojsak I, Mihatsch W, Molgaard C, Shamir R, Turck D, van Goudoever J; ESPGHAN Committee on Nutrition. Iron requirements of infants and toddlers. J Pediatr Gastroenterol Nutr. 2014 Jan;58(1):119-29. doi: 10.1097/MPG.0000000000000206. PMID: 24135983.
[14] Klein SL. Sex influences immune responses to viruses, and efficacy of prophylaxis and treatments for viral diseases. Bioessays. 2012 Dec;34(12):1050-9. doi: 10.1002/bies.201200099. Epub 2012 Sep 26. PMID: 23012250; PMCID: PMC4120666.
[15] White NJ. What causes malaria anemia? Blood. 2022 Apr 14;139(15):2268-2269. doi: 10.1182/blood.2021015055. PMID: 35420692.
[16] Davidsson L, Galan P, Cherouvrier F, Kastenmayer P, Juillerat MA, Hercberg S, Hurrell RF. Bioavailability in infants of iron from infant cereals: effect of dephytinization. Am J Clin Nutr. 1997 Apr;65(4):916-20. doi: 10.1093/ajcn/65.4.916. PMID: 9094872.
[17] Muzhingi T, Gadaga TH, Siwela AH, Grusak MA, Russell RM, Tang G. Yellow maize with high β-carotene is an effective source of vitamin A in healthy Zimbabwean men. Am J Clin Nutr. 2011 Aug;94(2):510-9. doi: 10.3945/ajcn.110.006486. Epub 2011 Jun 29. PMID: 21715509; PMCID: PMC3142725.

[18] Chandra J, Dewan P, Kumar P, Mahajan A, Singh P, Dhingra B, Radhakrishnan N, Sharma R, Manglani M, Rawat AK, Gupta P, Gomber S, Bhat S, Gaikwad P, Elizabeth KE, Bansal D, Dubey AP, Shah N, Kini P, Trehan A, Datta K, Basavraja GV, Saxena V, Kumar RR. Diagnosis, Treatment and Prevention of Nutritional Anemia in Children: Recommendations of the Joint Committee of Pediatric Hematology-Oncology Chapter and Pediatric and Adolescent Nutrition Society of the Indian Academy of Pediatrics. Indian Pediatr. 2022 Oct 15;59(10):782-801. PMID: 36263494.

[19] da Silva Lopes K, Yamaji N, Rahman MO, Suto M, Takemoto Y, Garcia-Casal MN, Ota E. Nutrition-specific interventions for preventing and controlling anemia throughout the life cycle: an overview of systematic reviews. Cochrane Database Syst Rev. 2021 Sep 26;9(9):CD013092. doi: 10.1002/14651858.CD013092.pub2. PMID: 34564844; PMCID: PMC8464655.

[20] Sunuwar DR, Sangroula RK, Shakya NS, Yadav R, Chaudhary NK, Pradhan PMS. Effect of nutrition education on hemoglobin level in pregnant women: A quasiexperimental study. PLoS One. 2019 Mar 21;14(3):e0213982. doi: 10.1371/journal.pone.0213982. PMID: 30897129; PMCID: PMC6428266.K

[21] Suter PM, Suter WN. Patient education. Timeless principles of learning: a solid foundation for enhancing chronic disease self-management. Home Healthc Nurse. 2008 Feb;26(2):82-8; quiz 89-90. doi: 10.1097/01.NHH.0000311024.11023.09. PMID: 18301109.

[22] Coghlan B, Coghlan S, Wilson A. Nutrition education fit for modern health systems. Lancet. 2019 Dec 7;394(10214):2071. doi: 10.1016/S0140-6736(19)32627-3. PMID: 31818407.