



Effectiveness of an Educational Project related to Sprouts for Mothers of Children aged 12-35 months with Iron-Deficiency Anemia. Alto Selva Alegre Health Center, Arequipa. Peru, 2015

---

Josefina Sonia Núñez Chávez and  
Elizabeth Concepción Robles Vizcarra

EasyChair preprints are intended for rapid dissemination of research results and are integrated with the rest of EasyChair.

November 13, 2019

# Effectiveness of an Educational Project related to Sprouts for Mothers of Children aged 12-35 months with Iron-Deficiency Anemia. Alto Selva Alegre Health Center, Arequipa. Peru, 2015

Josefina Sonia Núñez Chávez 1

Elizabeth Concepción Robles Vizcarra 1

1 Research Group of the Faculty of Nursing, Universidad Católica de Santa María, Arequipa, Peru  
[snunez@ucsm.edu.pe](mailto:snunez@ucsm.edu.pe)

**Abstract.** The objective was to develop an educational project to promote the consumption of germinated iron-rich seeds sprouts, by using educational strategies and participatory means. It was aimed at mothers in order to their children's hemoglobin levels to normal values. A pilot group was selected. This group stopped the treatment with ferrous sulphate and/or multi-micronutrients, and was given a diet with sprouts of lentils, wheat, and alfalfa instead. The means of monitoring and evaluation were a questionnaire and an observation guide applied at their homes during six months. For the analysis of results, the chi-square test, Student's *t*-distribution, and percentages were used. The conclusion was that children diagnosed with iron-deficiency anemia, whose mothers received participatory education about the preparation, use, and consumption of sprouts, were able to supplement their diet and raise their level of hemoglobin, adjusted according to their age.

**Keywords:** Educational project, iron-deficiency anemia, iron-rich sprouts, lentils, wheat, alfalfa.

## 1 Introduction

Iron-deficiency anemia is a public health problem at national level, especially among children, both in urban and rural areas. 39.9% of children between the ages of 06 and 35 months in urban areas have anemia; while in rural areas this problem affects 53.1%. [1]

In Peru, the diet does not provide the necessary amount to cover the requirements of this mineral, it only covers 62.9% in the case of children under five years.

One of the strategies of the Ministry of Health in Peru to prevent anemia is to provide multi-micronutrients to children from 06 to 35 months. These are provided in Growth and Development Clinics, in the form of powder composed of iron, folic acid, zinc, vitamin A and vitamin C, as an effective intervention to improve iron levels in serum. [1]

At Health Centers, it was noticed that mothers were not giving these iron supplements to their children, arguing that it constipated them. Hence the idea of using sprouts as an alternative natural treatment for iron-deficiency anemia for children between 12 and 35 months. These sprouts would be used to supplement their food.

Mothers did not know about the nutritional value of sprouts. Therefore, this educational project was proposed as a learning opportunity to facilitate and demonstrate the sprouts usefulness as a complement to their children and family's diet.

Sprouts of seeds contain the greatest vitality of a plant. Seeds have the potential to generate new life through a new plant and transfer vital energy to humans. They contain abundant minerals such as potassium, iron, calcium, among others. They are easy to grow. Only seeds, water and sunlight are necessary. Some of them only need two days to

germinate. Their soaking minimizes or eliminates anti-nutrients (enzymatic inhibitors, phytates, polyphenols, etc.).<sup>1</sup>

Mothers can also be sure these have not been altered or sprayed with insecticides. They are available any time of the year and are an alternative when there is a shortage of vegetables. They can be eaten alone or with side dishes like mashed potatoes, soups, tortillas, etc.<sup>2</sup>

It is important to mention that educating does not only mean informing or motivating, although motivation is a part of education. Motivation is understood as the attempt to generate positive attitudes to change behaviors, but respecting people's own decisions. Educating is not persuading or coercing, that is, to "prescribe" and pretend to achieve behaviors previously defined by an "expert".

An active, practical, participatory and integrating teaching style was the one proposed for this Health Education project; a type of education where the trainer and the trainee play an active role. It has shown the greatest capacity to change values, motivate attitudes and generate healthy behaviors.

The population subject to the teaching/learning project were the mothers of infants from 12 to 35 months of age, who receive a complementary feeding, attending the Alto Selva Alegre Health Center, in the district of Alto Selva Alegre, city of Arequipa, Peru, for their growth and development control. To determine the effect on children, their hemoglobin control was conducted with an adjusted value according to established standards, before and after the consumption of sprouts.

This work informs the results of the application of the educational project whose contents were the preparation, use, and consumption of sprouts in the diet; and the opinion of mothers on the sprouts used in the feeding of their young children.

## 2 Material & Methods

Design: quasi-experimental, comparative, and explanatory.

Population and Sample: Mothers of 16 children aged 12 to 35 months, with a diagnosis of iron-deficiency anemia, attending the Alto Selva Alegre Health center.

Sample: Mothers of children who stopped the treatment of anemia with ferrous sulphate and consumed sprouts of wheat, lentils, and alfalfa as an alternative treatment. They signed an informed consent form.

Methodology: Group education aimed at mothers through educational demonstration workshops, delivery of educational leaflets for the preparation of sprouts and recipes for feeding their children. Individual education with follow-up through home visits, at the beginning, during, and at the end of the experience, about the preparation, use, and consumption of sprouts. Evaluation of the impact on children's diet, by controlling blood hemoglobin at three points in time: at the beginning, during, and at the end of the research.

Instruments: For data collection, a follow-up questionnaire was used on children's nutrition before, during, and at the end of the educational program. For the evaluation, an observation guide was applied at home visits at the beginning, during, and at the end of the experience about the preparation, use, and consumption of sprouts. As well as report forms of home visits, invitations to workshops, and forms for controlling attendance at meetings and workshops.

---

<sup>1</sup> <https://alimentoconciencia.com/antinutrientes-un-problema-grave-en-el-consumo-de-cereales-legumbres-y-semillas/> / March 31st, 2012 by Alex Von Foerster

<sup>2</sup> <http://www.dsalud.com/reportaje/alimentos-germinados-semillas-de-salud/> Issue 78, December 2005.

Educational aids such as brochures and leaflets were used for educational purposes. Seeds of wheat, lentils, and alfalfa; glass jars, nets, and elastic bands were provided for the sprout preparation.

A hemoglobin meter was used for hemoglobin control and laboratory sheets were used to record the results.

### 3. Results

Socio-cultural characteristics of mothers: Age: 75% young adults, 18.8% mature adults and 6.2% teenage mothers. 100% of the mothers stated that they speak Spanish and had received education. The number of members per family was 81.2% with three to four members, and 18.8% with five or more. 87.5% of housing is single-family, and 12.5% are multi-family.

Regarding the care of children, 75% is in charge of mother and father, and within them, 37.5% also have the presence of a grandmother, who takes care of her grandchildren when parents are working. The remaining 25% are single mothers who live with their mothers, who support them with the care of their children.

Results on the form, frequency, consumption, quantity, tolerance, effects and opinion of mothers on sprouts, after the implementation of the educational project:

Table 1. Distribution of educational achievements among mothers, by majority of percentages.

Educational Achievements	N= 16	%
• Preparation Form: chopped	16	100
• Consumption: in salads and juice	15	93.8
• Frequency: three times a week	08	50.0
• Amount: one tablespoon	13	81.3
• Effect does not cause discomfort	11	68.8
• It is tolerated	14	87.5
• Opinion: good to very good	16	100

Table 1 shows that out of 16 mothers, more than 50% learned how to prepare the sprouts for feeding their young children, in reasonable frequency and quantity; 68% state that their children did not have any physical discomfort after eating the sprouts and that they were tolerated. The rest indicated that at the beginning of the consumption of wheat and lentil sprouts, their children had diarrhea. They were advised to stop for two weeks and then to restart. After this period, the sprouts were tolerated. 87.5% of mothers indicate that their children tolerate the sprouts, and that "the best sprout is alfalfa" because of its sweet taste.

With regard to their opinion on the importance of the nutritional value of sprouts, 100% think it is good and very good. It is therefore deduced that all mothers learned to use sprouts in the diet of their young children and in their family diet.

Results of the follow-up to mothers on the education of the preparation of sprouts :

Table 2. Hand washing before and after education

Hand washing	Before		After	
	N°	%	N°	%
• Yes	16	100	16	100
• No	0	0.0	0	0.0
Total	16	100	16	100

Table 2 shows that all mothers washed their hands when preparing food and that after this education, they kept the hand washing habit for food preparation as a means of hygiene to avoid risks of disease transmission.

Table 3. Protection of seeds from sunlight, at the beginning and at the end of sprouts preparation

Sun protection	Beginning		End	
	N°	%	N°	%
• Yes	15	93.8	16	100
• No	1	6.3	0	0.0
Total	16	100	16	100

Table 3 shows that in the first evaluation, 15 mothers (93.8%) protected the seeds from sunlight with a cloth. With continued education, 100% of mothers protected them from sunlight to prevent dehydration and lack of germination.

Table 4. Preservation of the sprout after its germination

Preservation	Beginning		End	
	N°	%	N°	%
• Environment	2	12.5	1	6.3
• Refrigeration	14	87.5	15	93.8
Total	16	100	16	100

Table 4 shows that 87.5% of mothers, from the first weeks after education, kept the sprouts in refrigeration. At the end of the educational program, that percentage increased to 93.8%. Only one mother did not do so because she did not have a refrigerator. She was therefore advised to prepare less quantity in order to prevent waste.

Results of the impact of education through the control of adjusted hemoglobin in the children of mothers subject to the educational process.

Table 5. Comparison of pre- and post-consumption adjusted hemoglobin results in children of mothers who received this educational program.

Statistical	Initial hemoglobin	Final hemoglobin
mean	10.50	11.72
standard d.	0.52	0.55
maximum	11.50	12.40
minimum	9.70	10.80
size	16	16

t=7.36                      p<0.05

Table 5, according to the Student's *t*-distribution for paired samples (t=7.36) shows that the initial hemoglobin (before) and the final hemoglobin (after) the consumption of sprouts presented significant statistical differences (p<0.05).

It also shows that the initial hemoglobin was 10.50 gr/dl and the final hemoglobin was 11.72 gr/dl, obtaining a final increase of 1.22 gr/dl of hemoglobin, reaching normal values according to the children's age. [3].

## 4 Discussion

In Peru, as part of the Second National Meeting on Health Promotion (held in Lima in Dec. 2005), a workshop was held to analyze and prioritize the health determinants in the country, based on the social and health situation of the Peruvian population. These were prioritized as follows: income and poverty, education, culture, food and nutrition, environments [4]. In consideration of this, the problem of anemia was addressed; one of the causal factors being inadequate nutrition, especially in the child population.

The Promotion of Healthy Food and Nutrition should seek that people, as family members, adopt appropriate food practices that promote their physical, mental and social well-being in order to improve their quality of life and human development. Health education is an instrument of health promotion, and therefore, an important role of health, social and education professionals.

In our case, the mothers adopted the use and consumption of sprouts as an alternative treatment for feeding their children with anemia, as shown in Table N°1. Nurses, Food Engineers, and Technical staff of the health facility played the role of educators.

Education should be based on dialogue and participation, fostering individual responsibility and collective cooperation. Thanks to the application of this type of education, there were changes in mothers' behavior and abilities related to sprout preparation, quantity, and frequency of consumption, as shown in Table 1.

The educational process started with meeting techniques (welcome, presentation, contract). Later on, new techniques were incorporated along with the previous techniques. The techniques used are accumulated, always in a process of continuous interaction of enriching feedback, with no fixed scheme or rigid application.

Tables 2, 3, and 4 show the results of the interactive participatory process applied through individual education with the technique of demonstrative skills. Training was provided to mothers at their homes and a follow-up was done through weekly home visits and group education every two months.

The problem of anemia in children in our country is a public health problem because of its high prevalence, as it compromises the lives of people due to its effects on physical and mental health. According to reported data (ENDES.INEI, 2013) the prevalence of anemia in children between 6 and 35 months of age in Peru is 43.8%, and 42% in the department of Arequipa. (ENDES INEI, 2015).

In the district of Alto Selva Alegre, the geographic scope of the study, the child population under five is not exempt from this problem. In 2014 there were 416 reported cases of iron-deficiency anemia (MINSA, HIS NIÑO Report), and at the Alto Selva Alegre Health Center, there were 185 cases.

One of MINSA's strategies to prevent anemia is supplementation with ferrous sulfate for children aged 6 to 35 months. These supplements are provided in Growth and Development Clinics. However, its side effect can be constipation [5], as mentioned by the mothers who abandoned this treatment. Therefore, they were offered the use of sprouted seeds as an alternative.

All seeds can undergo a germination process; however, seeds of toxic plants such as potato, tomatoes, aubergines and peppers should not be germinated. Among the edible seeds, there are Legumes: such as Chinese beans, alfalfa, lentils, beans, peas, clover, etc.; Cereals: oats, wheat, corn, rye, barley, quinoa, rice, among others; Oleaginous nuts such as almonds, walnuts, etc.; Vegetables: broccoli, carrot, celery, cabbage, spinach, fennel, turnip, onion, etc. [6].

For our study, we chose those with the highest availability on the market. We also considered germination time, iron content and best digestibility for children. Resulting in the choice of lentils, wheat, and alfalfa.

In the first month, boys and girls consumed lentils; in the second month, wheat; and in the third month, alfalfa. 100% preferred alfalfa sprouts for its pleasant taste and presentation, as mothers said.

Table 5 shows that the initial hemoglobin, before the consumption of sprouts, was 10.50 gr/dl, and the final hemoglobin, after the consumption of sprouts, was 11.72 gr/dl, obtaining a final increase of 1.22 gr/dl of hemoglobin, reaching normal values according to the children's age.

Therefore, we deduced that the alternative treatment with sprouts has positive effects of increasing the Hemoglobin values in children with anemia, with the advantage of not producing side effects as the ones produced by the treatment with iron supplements.

Health education addresses not only the transmission of information, but also motivation, personal skills and self-esteem needed to adopt measures to improve health. [7].

New methods should be based on social intervention, which involves the participation of individuals and the community, two-way flow of information between the health educator and the community, and a multi-professional and multi-sectoral approach [7].

It should be carried out by multiple professionals (social workers, psychologists, sociologists, engineers, lawyers, etc.) [1].

Education took place through family home visits to demonstrate the steps to prepare sprouts. This training was theoretical, practical, active, and participatory. There were also three workshops carried out in the health center for the motivation and signature of the informed consent, transmission of knowledge through demonstration performed by a food engineering professional and a nutritionist, delivery of educational leaflets on the nutritional value of food and sprouts, phases of preparation of sprouts, and the provision of material such as seeds, bottle, protection net for the bottle and rubber band to hold the net. Three nurses and two nursing students participated in the whole process.

The monitoring, counselling and evaluation was carried out according to a timetable coordinated with each of the mothers, applying the observation guide on a weekly basis for six months. The average duration of each session was one and a half hours.

The problems found were: having to return to the homes of some mothers on unscheduled dates, as some mothers worked outside their homes leaving their children in the care of grandmothers. Also, there was loss of bottles as they broke, but which were replaced.

## 5 CONCLUSIONS

The development of this participatory educational project applied to mothers ensured the effectiveness of the treatment for iron-deficiency anemia through the addition of sprouts in the diet of their children from 12 to 35 months of age, demonstrated with the preparation, use, and consumption of sprouts with other foods. The sprout best tolerated was alfalfa.

The impact of the education directed to the mothers of children from 12 to 35 months of age, with diagnosis of iron-deficiency anemia, who consumed the sprouts with their food, was to raise the level of hemoglobin to normal values according to their age and to recover their health.

**Acknowledgements.** To the Research Center, now Vice Chancellor of Research of the UCSM that financially supported the execution of this project.

To the group of two students of the Faculty of Nursing of the Universidad Católica de Santa María who participated as part of the team of researchers applying evaluation instruments. As well as to the Food Engineer Cinthya A. López Núñez who prepared educational material and carried out the educational demonstration as a follow-up and evaluation of the preparation of sprouts for each mother at their homes.

To the health personnel of the Alto Selva Alegre Health Center who contributed with technical aspects of the laboratory and nutritional counseling.

## References

1. MINSA. (2014-2016) National Plan for the Reduction of Chronic Child Malnutrition and the Prevention of Anemia in the Country. Lima, Peru.
2. Head Office Resolution N° 090-2012-J-OPE/INS approving Technical Guide N° 001/2012- CENAN-INS "Procedure for the Determination of Hemoglobin by means of Portable Hemoglobin Meter. Lima, Peru.
3. MINSA. Hemoglobin Concentration Values in Boys and Girls (up to 1000 m.a.s.l). Ministerial Resolution N° 055-2016
4. MINSA (2015). National Health Institute. Anemia in the Child Population of Peru: Key Aspects to Address it. Lima, Peru.
5. MINSA. (2015). Practical Guide for the Diagnosis and Treatment of Iron Deficiency Anemia in Children and Adolescents in Health Facilities of the First Level of Care. Resolution 028-2015
6. Research Gate Latin American Nutrition Archives. Bioavailability of Iron in Food. Vol.49, n.2, 1999. Gaspar Ros, 22 July 2016. p. 108-11.
7. Ministerial Resolution N° 958-2012/MINSA, approving the Technical Document; Demonstration Sessions on Food Preparation for Mother and Child Population. Lima, Peru.