

Animal Source Foods to Improve Micronutrient Nutrition and Human Function in Developing Countries

Formative Research to Develop a Nutrition Education Intervention to Improve Dietary Iron Intake among Women and Adolescent Girls through Community Kitchens in Lima, Peru^{1,2,3}

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ABSTRACT Formative research was conducted with 26 women and 16 adolescent girls to develop an education intervention through community kitchens (CK) in Lima, to increase their dietary iron intake and improve their iron status. A combination of qualitative research methods was used to explore perceptions about foods, nutrition, health, anemia and body image. The women recognized that there was a close association among eating well, "alimentarse bien", their health and prevention and treatment of anemia. They perceived that the nutritive value of a meal is determined primarily by its content of "nutritious" foods and by its being "balanced". Using this information the conceptual model of the education intervention was developed. The vulnerability of women to anemia was presented with the relationship between anemia and diet as the central focus. Feasible ways of achieving a nutritious diet were introduced to the community kitchens through promoting local heme iron sources and the consumption of beans with a vitamin C source. Animal source foods were amongst those considered to be nutritious and were "best buys" for iron content. CK searched for ways of assuring accessibility to these foods. The use of animal source foods in the community kitchen menus increased during the intervention. *J. Nutr.* 133: 3987S–3991S, 2003.

KEY WORDS: • *iron deficiency anemia* • *iron-rich foods* • *formative research* • *women*

Iron deficiency anemia is the most prevalent nutritional problem worldwide, particularly affecting reproductive-aged women and children of developing countries. Numerous and severe consequences may result from iron deficiency including negative effects on health, fetal and child development, activity and well-being. In Peru, the prevalence of iron deficiency anemia in nonpregnant women of fertile age is ~35% at the national level and 70% in children aged 6 mo–2 y (1). In periurban populations of Lima, similar levels have been found

(2,3). In addition, recent studies on adolescent girls in Lima have shown a prevalence ranging from 10–14% (4,5). Zinc deficiency has been reported both in pregnant women in Lima (6) and in young children (7).

Increasing animal source food (ASF) intake has the potential to benefit the nutritional status of many vulnerable populations in developing countries, due primarily to the higher content and bioavailability of specific nutrients. Flesh foods are especially good sources of iron and zinc. Amongst the strategies for reducing iron deficiency anemia at the population level (supplementation, fortification of foods and dietary improvement), dietary modification, and specifically increasing animal source foods, will lead to improvement in the overall quality of the diet. Specific strategies to improve iron intake include increasing their consumption of the following: 1) total dietary iron; 2) low cost, high bioavailable heme iron (e.g., chicken offal, blood, fish); and 3) nonheme iron absorption enhancers (e.g., consuming a vitamin C food source with meals).

In periurban Peru, community kitchens (CK) came into existence to provide a main meal at low cost to impoverished families. As reflected in the meals prepared in the CK and in the homes, typical Peruvian diets are low in bioavailable iron; yet in periurban populations, ASF are available throughout the year, providing a potential for dietary modifications to improve iron intake using locally available foods (8,9).

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The presence and popular use of the community kitchens provided a unique opportunity to develop a nutrition education intervention designed to improve the iron content of the meals prepared. At the same time, the development of key nutrition communications targeted at women and adolescent girls, to improve awareness and knowledge about anemia and its prevention, was seen as central to improving dietary intake.

Fundamental to designing the dietary modification education intervention is the need to understand the target population's perceptions and knowledge about diet, nutrition and health, as well as more specific aspects related to anemia and iron-rich foods. These concepts, and how they interrelate, provided insights into potential for change. Understanding the potential costs and benefits of dietary modification, and the expectations and aspirations of the women, provided motivational elements for the behavior change (10). This article reports on the formative research conducted to understand perceptions of the women and adolescent girls participating in the CK, focusing specifically on the ability to increase iron-rich food intake, particularly animal food sources. The intervention was implemented based on the results of the formative research and its impact evaluated through a comparison between intervention and control CK.

METHODS

Setting and population

The formative research took place in a poor periurban community located in the periphery of Lima. Housing structures consisted of both brick and precarious material (straw matting, cardboard). Water and sewage services were recently installed but the supply of water was irregular. Most of the women came originally from the central highlands, although at the time of the project (1995–1997) they had lived in Lima for several years.

The sample consisted of eight community kitchens that were randomly selected from the possible 38 operating CK in the study area. From the lists of members and beneficiaries of the eight kitchens, a total of 42 women and girls were interviewed. This included a minimum of two women and two adolescents randomly selected from each kitchen. The sample thus consisted of 16 adult women participants of community kitchens, 16 adolescent girls, who were daughters of participants, as well as the eight leaders of the CK, one local health worker, and one school teacher. The ages of the women participants and adolescents ranged from 12 to 37 y, but some of the leaders were older, the eldest interviewed being 51 y. Prior consent was obtained from all women and girls interviewed.

Data collection methods

A combination of semistructured and structured qualitative research methods was applied to explore the perceptions of women and adolescent girls about food, nutrition, health, anemia and body image (11–13). These methods were conducted by two anthropologists and two nutritionists. Each method is outlined below.

Semistructured interviews. Semistructured interviews were completed with each of the 42 women in the sample. Ethnographic guides were prepared for the interviews, which lasted 2 h on average. Field notes were taken and each interview was recorded and transcribed. Some interviews were completed in two sessions.

Pile sorts. Unconstrained pile sorts were conducted with 24 of the women and adolescents to explore the concept of food combinations (14). Thirty cards, each with a colored drawing of a different food selected from the market surveys, were shown to each participant. Each participant was asked to sort them freely into groups of foods that she felt went together. Participants were allowed to create as many piles as desired according to whatever criteria made sense to them. After sorting all the cards, investigators explored the meaning or characteristics that each pile had for the woman or adolescent. In

addition to the open pile sorts, adolescent girls were asked to group the same set of food cards according to likes and dislikes.

Market surveys. Four market surveys during the year were conducted to identify seasonal variations in local food availability and prices. With this information, “best buys” for foods that were inexpensive and rich in iron or vitamin C were calculated using the Mejour Compra software (15).

Photo projection technique. The photo projection method was used with 32 women and adolescents to explore the following areas in each individual: ideals of body image, self-esteem, aspirations and motivations (13). After several photos from magazines were displayed, participants were asked to comment on the different areas as mentioned above and whether she liked the photos or not. Later the participant was asked to select one photo she liked and describe the life of the woman or girl chosen.

Data analysis

Field notes and recordings from the semistructured interviews were coded by specific themes. Eleven codes for topics and 42 codes for subtopics were created to reflect the themes that emerged from the text. Content analysis was carried out on coded text. The software package dtSearch (DT Software, Arlington, VA), a text retrieval program, was used to search interview data for specific codes and text surrounding the codes to facilitate the analysis. Pile sort data was analyzed using ANTHROPAC software (Analytic Technologies, Harvard, MA). Multidimensional scaling and hierarchical clustering (closest neighbor) analysis was completed with the pile sort data.

The data was reviewed by all members of the multidisciplinary team of nutritionists and anthropologists, and conceptual diagrams were constructed to explain the relationships within and between the different themes. This was facilitated by the mix of methods used, which provided richness, depth and complementarity in the data analysis of each topic.

RESULTS

The results of the most important themes identified from the semistructured interviews and photo-projection technique are described, followed by specific data from the structured techniques. Numbers in parenthesis refer to the number of women or girls who mentioned each item.

Health and nutrition. For both the women and adolescent girls interviewed, the word “health” included descriptors of physical and mental well-being and the ability to work and carry out activities of daily living. Fifteen of 16 adult women and 10 of 16 adolescent girls recognized a primary relationship between health and food; an adequate diet was associated with the absence of illness and a poor diet associated with a greater risk of ill health.

From the photo-projective technique and semistructured interviews, the typical description of a healthy woman is demonstrated in the following quote: “. . . is full of life, happy, tranquil, rounded and healthy—she is not too fat, she's normal. . . pretty, her body is nicely filled out, neither thin nor too fat” (woman 36 y).

In addition, the healthy woman has a good appetite, eats well (“alimentarse bien”) and works or attends her daily chores/routines with energy and vitality. For the adolescent girls, the descriptor “a good student” was added. These descriptions clearly contrast with those of a sick woman, who is described as having pale or sallow skin tones, decreased appetite, does not eat well, loses weight and experiences head and/or body aches.

Good and poor eating/nutrition. The Spanish verb “alimentarse” is central to food itself, the act of feeding and the nutritional status obtained from eating. Therefore “alimentarse” describes both the ingestion of foods and the body's process of using the food. Eating well or “alimentarse bien”

therefore suggests that the ingested foods are nutritious and provide the necessary elements for the body's function. Nutritious and balanced foods were identified as necessary properties of food that ensure that a person would "alimentarse bien". In contrast, eating poorly, "alimentarse mal", signifies that the ingested food is not sufficient, either in quantity or quality, or is not opportune, i.e., is not eaten at regular mealtimes, thus depriving the body of necessary nutrition.

The results of the two-dimensional scaling and hierarchical clustering of the pile sorts are displayed in Figure 1, showing how the grouping of the foods is perceived by the adolescent girls and the different criteria the participants chose to group foods in Table 1. The perceptions of appropriate combinations of foods were primarily classified by meals, foods prepared or eaten together, types of foods and the perceived nutritional value of foods. This information was useful in the selection of the foods and food combinations to be promoted for meals.

Nutritive value of food. As mentioned above, the women consider that the foods or ingredients used in meals help define the nutritive value of the meal, for example, if the foods are described as having "vitaminas" or "proteinas". Certain foods were considered to be of high nutritional value, such as milk, vegetables, fish, beans, fruit, eggs, quinoa (a high protein Andean cereal) and beef, whereas other foods were perceived to be of minimal nutritional value or were mentioned as being nonnutritious, including chicken (because of hormones used in their production), rice and pasta (considered to be only fillers). Foods considered to be valuable were not limited to one particular "nutritional" food group but included foods from different food groups.

Balanced meals. A nutritious meal is one that was considered to be "balanced", signifying primarily that the combination of foods or ingredients, and combination of dishes in the meal, is appropriate, e.g., if the main course is "heavy" (e.g., beans), then the soup should be light and vice versa, and there should be variety.

Anemia. The principal signs and symptoms of anemia that were identified corresponded to those that described an unhealthy person. Other symptoms mentioned included weight loss, lack of concentration in school, apathy and irritability.

TABLE 1

Reasons for grouping the foods

Reason	Examples
1) Different preparations of meals	Fish, rice and salad Egg and oil
2) Types of foods	Meats, fish, liver, egg, blood Fruits, vegetables
3) Nutritive value	Nutritive foods: beans, meats, milk Nonnutritive foods: sweets, rice
4) Types of meals	Breakfast Lunch
5) Their likes/dislikes (adolescent girls only)	Chocolates, sweets (likes) Liver, beans, blood sausage (dislikes)

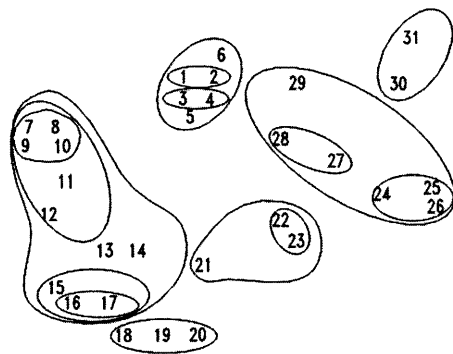
Anemia was mentioned as an illness that can affect both men and women. It was described as an advanced stage of weakness rather than as a condition affecting the blood. For the informants, weakness was a temporary loss of energy, experienced by many, but in some people it worsened to anemia over time if not treated. Typically a thin woman was described as "anemic"; however, a heavy woman could also suffer from anemia, because fatness was not considered synonymous with health. "False fatness" was used to describe a person that was fat but unhealthy.

The major cause of anemia was attributed to a "poor diet" "alimentarse mal" (25/39 mentions), that is, insufficient quantity and quality of food or a neglect of good feeding habits such as not keeping to meal times. The following quotes illustrate these beliefs: "Anemia is because one does not eat well, ('no se alimentan bien'), either because there isn't enough (money), perhaps because one doesn't have work or does not eat very well" (woman aged 50 y); "The girls become anemic because they do not like to eat so as not to get fat and they prefer to drink sodas with sweet breads or any sweet food" (girl, aged 12 y).

The deficiencies were described primarily as being due to "carelessness" in eating habits, worry, preference or lack of time. However, involuntary circumstances such as poverty and unemployment were also cited. Other causes cited included: giving birth/menstruation (3 mentions), eating too many sweets (4 mentions) and drinking too much lemon juice (3 mentions). Lack of iron or vitamins was rarely suggested (2 mentions).

Anemia treatment. As the principal cause of anemia is an inadequate diet, improving the diet is considered the best way to counteract it, thus "alimentarse" is related to both the cause and the treatment of anemia. General dietary improvement and keeping to a routine of mealtimes, as well as consuming specific foods, are considered the most appropriate treatments. Specific foods include those that are i) vitamin rich, such as liver, spleen, spinach and fruit extracts; ii) red in color and thought to be related to the blood: blood pudding, beets; and iii) specific curatives including frog and pigeon's blood. Thus, the belief exists that food has recuperative powers as well as the ability to maintain health.

Anemia and blood. Perceptions of the women and girls toward blood and menstruation were explored to discover any appreciation of a specific vulnerability of women to anemia. The women and girls interviewed recognized a direct relationship between food and the condition of the blood, but not between blood and anemia. Blood represents life and energy; thus any disorder of the blood affects the whole organism.



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|-----------|------------|--------------|--------------|--------------|
| 1 Meat | 8 Papaya | 14 Sweet Pot | 20 Peas | 26 Tea |
| 2 Chicken | 9 Mandarin | 15 Lettuce | 21 Wheat | 27 Milk |
| 3 Lung | 10 Orange | 16 Spinach | 22 Rice | 28 Egg |
| 4 Liver | 11 Lemon | 17 Cabbage | 23 Pasta | 29 Oil |
| 5 Blood | 12 Tomato | 18 Lentils | 24 Infusions | 30 Sweets |
| 6 Fish | 13 Potato | 19 Beans | 25 Coffee | 31 Chocolate |
| 7 Mango | | | | |

FIGURE 1 Multidimensional scale based on pile sort of free grouping of local foods by adolescent girls.

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Again, “alimentarse” affects the blood. Nutrition during childhood has a cumulative effect on the quality and quantity of the blood; a child who has not been adequately nourished during childhood will have “weaker” blood than one who has been well fed.

Best buy. The results of the market surveys showed that the best buys for inexpensive iron rich foods were chicken’s blood, spleen, beans and chicken’s liver.

Design of the intervention. The information obtained from the various qualitative methods, including the inter-relationships between the different themes, was used to develop the conceptual model for the behavior change communication intervention (Fig. 2). Because anemia and its symptoms were recognized, the central focus of the intervention was on increasing knowledge about the vulnerability of women to anemia. The high prevalence of anemia amongst women of fertile age in the community was stressed, and awareness of the symptoms of anemia and its effect on health, activity and productivity was reinforced. At the same time, the association between the absence of anemia and well-being, good health, energy and vigor, appearance and achievement were emphasized as important motivational elements.

As shown in the conceptual model, the relationship between anemia and nutrition and food, already well recognized by the women, was used as the central focus of the intervention. In the campaign, good nutrition and food (“alimentarse bien”) were stressed as being essential to the prevention of anemia for the maintenance of good health and for having a positive and attractive body image. This was achieved through promoting the importance of consuming a balanced diet, the preparation of appropriate meals and the inclusion of selected low cost foods that were recognized by the women for their nutritive value. These low cost foods included animal source foods, recognized by the women for their high nutritive value and their specific curative and preventative properties. Thus, the principal recommendations for the intervention were 1) increase intake of acceptable local heme iron sources, including chicken’s liver, chicken’s blood and fish; and 2) increase the consumption of beans with an acceptable vitamin C source at meal times, such as vegetable salads with lemon juice and lemonade. These concepts, and how to include them in the diet, were reinforced

with the recipes developed with the CK. The ideal body images of the women and girls, expressed through the photo-projective technique, were applied to the posters and other print material distributed in the intervention, as motivational elements. These were extremely successful in motivating the target populations, stimulating identification with the campaign as well as being attractive.

To address the limited accessibility to heme iron food sources, chicken and turkey liver and chicken blood were made available at cost price by a commercial chicken producer during 5 mo of the intervention, after which this program was discontinued due to unrelated circumstances. During the time the program lasted, the demand for liver by the CK increased from 37 to 94 kg per mo, showing the increase in its use and popularity due to its acceptability and versatility, whereas the demand for blood decreased from 34 to 0 kg in the same period, indicating less acceptability of this food. After this period, the intervention CK obtained chicken liver directly from their local markets.

The intervention CK menus were observed over a period of 27 wk. A heme source of iron was included in the menus a mean of 3.2 times per wk during that time, and liver, spleen, blood or fish, specifically, 1.6 times. The combination of beans plus a vitamin C source (salad) was served 1.7 times and beans plus an animal food 0.24 times a wk. The latter was considered to be a luxury combination.

The intervention by the project team lasted for 9 mo and was targeted at different levels: with the leaders and members of the CK it increased knowledge, modified the menus and assisted in finding ways to increase accessibility to heme iron food sources. The team also conducted interpersonal educational activities with groups of women and adolescent girls. The results are presented in more detail elsewhere (5). There was a significant increase in knowledge in the intervention group, particularly that the ASF contain heme iron to prevent anemia; at the end of the study 66% of the women and girls in the intervention group (total $n = 142$) mentioned that liver, fish or blood are foods that prevent anemia vs. 11% in the control group ($n = 110$, $p < 0.01$). Dietary intake of total and heme iron (estimated by 24-h recalls of intake) increased significantly in adult women and particularly in adolescent girls, in the intervention group versus the control group ($p < 0.05$), although intakes were still below recommended daily levels.

“Healthy and Pretty with a Balanced Diet”

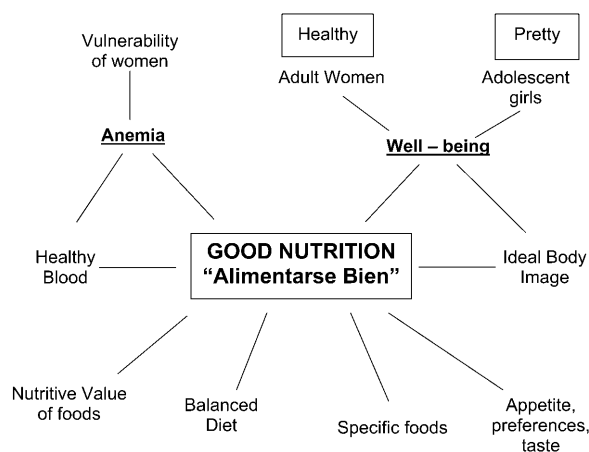


FIGURE 2 Conceptual model of the intervention: interrelationships of the principal themes.

DISCUSSION

The information obtained from the formative research with the women and adolescent girls led to the design of the education intervention. A close association was seen between nutrition and health, and anemia is situated within this context.

The relationship between food and health for the women and girls of this population is defined by “alimentarse bien” (adequately fed or nourished). “Alimentarse bien” is equated with, or defines, health, represents the ingestion of foods to nourish the body well and prevent illness, and is a treatment for illness. Within this context, anemia is considered to be the result of a poor diet and “alimentarse bien” is necessary to prevent and recover from anemia. These relationships have been observed elsewhere (16) and also applied to the perceptions of anemia in young children in a similar community (17).

Table 1 displays the different criteria participants chose to group foods. Knowledge of the benefit of ASF and heme iron food sources, and the incorporation of these foods into the CK daily menus, increased in the intervention community,

demonstrating that increasing ASF was possible and successful in these poor periurban communities. Although availability and cost of these foods may be limiting factors, the CK leaders and participants were sufficiently motivated to search for low cost strategies to overcome these limitations to the extent possible with their resources. A combination of strategies was adopted by the CK to increase iron consumption, and, in fact, increasing animal iron sources was more successful than increasing the frequency of bean consumption. For the intervention, several recipes were developed through a participatory process with the women and were a great success and accepted well. These innovative recipes were mostly modifications of ones traditionally used, but incorporated iron rich heme sources from the "best buy", consistent with the importance that was placed on the quality of the food. A combination of strategies to improve dietary iron intake was adopted for the intervention, yet foods the women selected that were central to these preparations were the cheaper and more accessible heme iron sources, for example chicken's liver. Their selection was based on their recognized nutritional qualities and ability to prevent anemia and to promote health and well-being. Thus dietary modification to improve health, and specifically increasing intake of animal source foods, was seen as a valid approach in this community. It builds on and strengthens the perceived and actual influence that diet has on health, and is of prime concern to women, resulting in the motivation of the women and girls to find ways of increasing their dietary iron intake.

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