ORIGINAL ARTICLE

Peripheral pharmaceutical intervention program for the prevention of iron deficiency anemia in children

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ABSTRACT

Objective: To identify how the implementation of a peripheral pharmaceutical intervention program influences the prevention of anemia in children from 0 to 5 years of age.
Materials and methods: A quantitative, descriptive and comparative study was conducted with a purposive non-probability sampling. The study population consisted of 40 children and the sample included 28 children from 0 to 5 years of age, of both sexes, living in the Carlos Manuel Cox shanty town, located in the district of Ancón, province of Lima, Peru. Hematological tests were performed to measure the hemoglobin level in the children, and questionnaires were administered to their caregivers or parents. An awareness program on anemia, parasitosis, nutritious food, good hygiene practices, medical control and pharmacological treatment was undertaken. A Likert scale was used to determine the prevention of iron deficiency anemia. For blood analysis, a microhematocrit test was performed to measure the hemoglobin levels, prior to the awareness of anemia. The sampling was carried out by a medical technologist together with the researchers. Data processing was conducted using IBM SPSS Statistics V25.0 and Microsoft Excel programs. Correlations between variables were determined using Pearson's correlation coefficient.
Results: Concerning the results of knowledge about anemia, a mean of 7.6 and a standard deviation of 2.5 were found in the pretest, and a mean of 18.0 and a standard deviation of 0.0 were found in the posttest, thus there was no increase in knowledge.
Conclusions: The pharmaceutical intervention program positively influences mothers' knowledge about the prevention of iron deficiency anemia in their children.

Keywords: Anemia; Biopharmaceutics; Child (Source: MeSH NLM).

Programa de intervención farmacéutica periférica para la prevención de anemia ferropénica en niños

RESUMEN

Objetivo: El objetivo fue identificar cómo la aplicación de un programa de intervención farmacéutica periférica influye en la prevención de la anemia en niños de 0 a 5 años.
Materiales y métodos: El estudio se aplicó bajo un enfoque cuantitativo y fue descriptivo y comparativo. Se realizó un muestreo no probabilístico de tipo intencional. La población fue de 40 niños, con una muestra de 28 niños (de 0 a 5 años) de ambos sexos pertenecientes al asentamiento humano Carlos Manuel Cox, en el distrito de Ancón en la provincia de Lima, Perú. Se aplicaron pruebas hematológicas para medir el nivel de hemoglobina en los niños, así como cuestionarios que resolvieron sus cuidadores o padres. Se sensibilizó sobre la anemia, así como acerca de la parasitosis, alimentos nutritivos, hábitos de higiene control y tratamiento médico y farmacológico. Se aplicó una escala de Likert para la prevención de la anemia ferropénica. Para el análisis de sangre, se procedió con una prueba de microhematocrito

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para medir la hemoglobina, previa sensibilización sobre la anemia, en la que la toma de muestras estuvo a cargo de un tecnólogo médico junto con las investigadoras. El procesamiento de datos se realizó con los programas SPSS 25.0 y Microsoft Excel. Las correlaciones entre las variables se determinaron mediante el coeficiente de correlación de Pearson.
Resultados: Respecto a los resultados de conocimientos sobre anemia, en el pretest se encontró una media de 7,6, con una desviación estándar de 2,5, que después, en el postest, se presentó como 18,0 y 0,0, respectivamente; por lo tanto, no representa un aumento en el conocimiento.
Conclusiones: Se determinó que el programa de intervención farmacéutica influye positivamente en el conocimiento de las madres sobre la prevención de la anemia ferropénica en sus hijos.

Palabras clave: Anemia; Biofarmacia; Niño (Fuente: DeCS BIREME).

INTRODUCTION

Anemia is the most common disease that affects the child population worldwide. According to the World Health Organization (WHO), 293 million preschoolers suffer from anemia [1]. Moreover, this disease has a negative impact on individuals' heath, i.e., their physical and cognitive development, if left untreated. Therefore, it greatly affects children's growth, development and learning, which is key to their future, a situation that will obviously have an impact on the development of the population [2-4].

Likewise, peripheral pharmaceutical care is a discipline focused on different aspects in primary health care aimed at obtaining more knowledge about the common good. Currently, the disease prevention experience in Peru is pioneer concerning the community training through peripheral pharmaceutical care to individuals, families and communities. A key aspect of this plan is to facilitate pharmaceutical professionals' training and to objectively provide them with all the technical tools to better update the primary health care in the higher levels. Several projects are being implemented in Peru in order to teach people about good eating habits and achieve greater social inclusion [5].

Furthermore, anemia is the most important cause of child death worldwide and a problem that should be removed as a priority in this millennium [2,6,7]. Malnutrition in the child population of low-income and poor countries adds up to this problem [8,9]. According to the WHO [10], 44 % of children in Peru have anemia. This disease shows its highest incidence in areas of extreme poverty, particularly due to the lack of knowledge and poor economy [11-13]. The main expression of anemia is low hemoglobin. However, these values vary according to age and sex, as in women of childbearing age and adult men, who have different hemoglobin levels. Statistics of people with anemia are presented in segments by city or region [10]. It is estimated that more than 1,600 million people have anemia, 50 % of whom are children under 6 years of age, with the highest incidence occurring in low-income countries such as those in Africa but also in Latin America and the Caribbean, showing significant figures. Countries having a high rate of anemia are Honduras, Peru, Bolivia and Haiti. These four countries gather 50 % of the patients with anemia in the region. In spite of the programs developed in municipalities and cities with high poverty rates, the expectations regarding changes and goals set at the macro level have not been met [10]. Meanwhile, not only the WHO but also the United Nations (UN) are concerned about this problem and are researching the impact of anemia for the purpose of reducing the risk of developing this disease, particularly in children and women, as well as child malnutrition at least by half [14].

Anemia is a disease that affects the nervous system and the development of cognitive abilities. Scientific experiments have demonstrated that the level of difference between the intellect of people who suffer from anemia and those who do not is 5 points, implying a negative influence in their future that could last a lifetime [15-17]. In this respect, malnutrition cases in Peru during 2017 decreased 1.3 %, which means that approximately 39,000 boys and girls did not have malnutrition. Currently, this figure dropped even more (6.4 %); that is, more than 201,000 children under 5 years of age do not have malnutrition [18].

According to the maternal, newborn and child health indicators of the 2016 Encuesta Demográfica y de Salud Familiar (ENDES - Demographic and Family Health Survey), the head of the Instituto Nacional de Estadística e Informática (INEI - National Institute of Statistics and Informatics) stated that chronic malnutrition affected an important part of the child population, particularly in the poorest areas, such as Huancavelica and Cajamarca, the jungle, among others, which accounted for 23 %, a figure that decreased 5 points in 16 regions in the last year [18].

As for the prevention of anemia, micronutrient supplementation has been implemented in Peru, prioritizing the population sectors categorized as vulnerable by means of medium-term projects, in principle, in cooperation with international institutions. One of the interventions based on the intake of micronutrients occurred in 2001 as part

of the Programme for International Student Assessment (PISA) and there was also a second intervention with the support of the World Food Programme (WFP Peru). The first intervention used micronutrients in the form of chewable tablets and the second one a micronutrient powder known as "Chispitas." [19]

If the problems related to anemia continue in the country, there is a risk that physical and mental disabilities will increase in the future, which may lead to several problems. First, academically speaking, the intelligence quotient of the students can be reduced in up to 5 points. This results in slower learning, concentration problems and decreased neural connectivity. Second, at the physical level, this disease causes slower growth and reduction of sensory, auditive and visual abilities, among other conditions. Likewise, concerning health, it reduces resistance to infections and diseases.

There are studies such as those conducted by Manrique-Carbonel [20] and Pérez [21] that have evidenced the effectiveness of these educational programs to increase the knowledge about the prevention of iron deficiency anemia. It was also found that 61.1 % of the participants had little knowledge about the diagnosis and treatment of anemia but their knowledge improved after these interventions. This has also been reported in the study conducted by Garro [22], where the main objectives were to identify mothers' cognitive level and prevention practices of iron deficiency and malnutrition in a group of children aged between 6 and 36 months. It was concluded that the educational program was effective because it increased mothers' cognitive level and prevention practices by 100 %. Furthermore, Oyos and Taipe [23] found that parents did not know the importance of their children's nutrition and researched the quality of the food their children should eat to improve their academic performance. On the other hand, Huayaney [24] found the highest number of mothers that knew how to prevent anemia, most of whom agreed that children should be fed with iron-rich animal products, besides lentils, beans, peas and fava beans, at least three times a week.

The present study is conducted in families so that the intervention programs may reduce iron deficiency anemia rate among the child population from 0 to 5 years of age. For this purpose, parents should be advised about the importance of preventing anemia in their children. Furthermore, this study demonstrated that using the pharmacist-led educational intervention has a significant and positive impact on the knowledge and prevention of iron deficiency anemia. Moreover, pharmaceutical chemists play an important role in this work because they have the opportunity to voluntarily participate in different health topics and contribute, in a positive manner, to the local community through their work in neighborhood drugstores. This study is important since it demonstrates, in a practical way, how such intervention is essential to prevent anemia, particularly in a time when nutritional and vitamin care is rarely implemented, which makes people more likely to suffer from diseases or disorders such as anemia.

Based on the foregoing, this study aimed to identify how the implementation of a peripheral pharmaceutical intervention influences the prevention of anemia in children from 0 to 5 years of age.

MATERIALS AND METHODS

Study design and population

This was a quantitative-approach and quasi-experimental study [25,26]. On the other hand, the population consisted of a total of 40 children from 0 to 5 years of age living in the Carlos Manuel Cox shanty town, located in the district of Ancón, province of Lima, Peru. The study sample included 28 children (1 boy and 27 girls).

Variables and measurements

The following techniques were used: intervention and awareness program on anemia, parasitosis, nutritious food, good hygiene practices, medical control and pharmacological treatment.

Instruments

A Likert scale was used to determine the prevention of iron deficiency anemia. Additionally, parents signed an informed consent form indicating their approval to draw a sample of their children for anemia screening. For blood analysis, a microhematocrit test was performed to measure the hemoglobin levels, prior to the awareness of anemia. The sampling was carried out by a medical technologist together with the researchers.

The survey was administered in the Carlos Manuel Cox shanty town, located in the district of Ancón, Lima, Peru, at kilometer 43 of Northern Lima.

Awareness program

The objective was to aware parents of the importance of preventing iron deficiency anemia. The parent talk included anemia definition, causes, signs and symptoms, consequences, prevention and treatment. Other topics covered in the talk were the importance of preventing parasitosis, nutritious food choices, medical control and pharmacological treatment. The test was also administered to parents to find out their knowledge about anemia. Anthropometric measurements (weight and height) of children from 0 to 5 years of age were taken to register their current nutritional status, as well as a blood sample for anemia screening.

Statistical analysis

Data processing was conducted using IBM SPSS Statistics V25.0 and Microsoft Excel programs. Correlations between variables were determined using Pearson's correlation coefficient.

Ethical considerations

Those willing to participate in the study signed an informed consent form before taking part in the survey. Confidentiality of personal data was maintained according to the Declaration of Helsinki ethical principles.

RESULTS

Table 1 shows that the mean scores of the knowledge about medical control and pharmacological treatment before the peripheral pharmaceutical intervention is 10.6 ± 2; the mean scores of the knowledge about medical control and pharmacological treatment after the peripheral pharmaceutical intervention is 13.1 ± 2. It is observed that there is a significant increase ($p < 0.05$) of the mean scores of the knowledge about medical control and pharmacological treatment after the peripheral pharmaceutical intervention (Figure 1).

Table 1. Comparison of the mean scores of the knowledge about medical control and pharmacological treatment before and after the implementation of the peripheral pharmaceutical intervention program

	Mean	*N*	Standard deviation	T	*p*
Before	10.6	28.0	2.0	6.1+	0.000*
After	13.1	28.0	2.0		

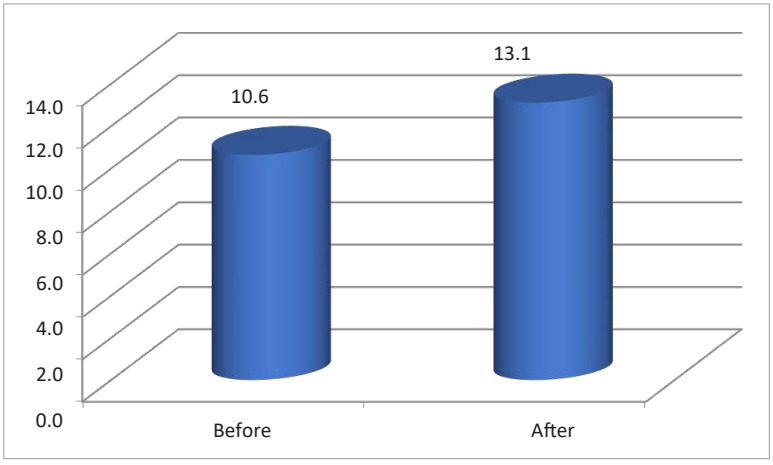

Figure 1. Knowledge about medical control and pharmacological treatment before and after the implementation of the peripheral pharmaceutical intervention program

Table 2 shows that the mean hematocrit score before the peripheral pharmaceutical intervention is 10.8 g/dl ± 0.9 g/dl; the mean hemoglobin score after the peripheral pharmaceutical intervention is 11.6 g/dl ± 0.7 g/dl. It also shows that there is a significant increase ($p < 0.05$) of hemoglobin after the peripheral pharmaceutical intervention (Figure 2).

Table 2. Comparison of hemoglobin mean scores before and after the implementation of the peripheral pharmaceutical intervention program

	Mean	*N*	Standard deviation	T	*p*
Before	10.8	40.0	0.9	6.36+	0.000*
After	11.6	40.0	0.7		

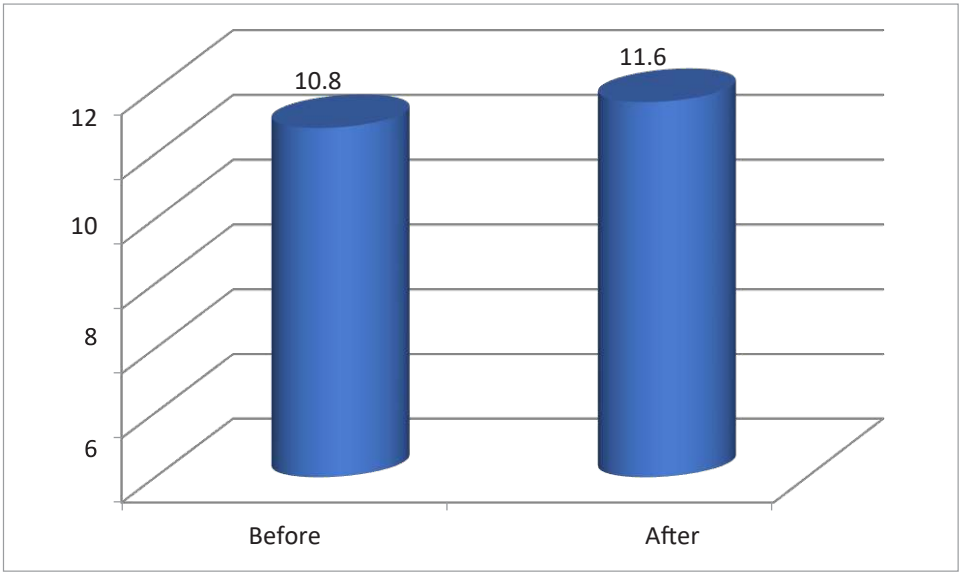

Figure 2. Comparison of hemoglobin mean scores before and after the implementation of the peripheral pharmaceutical intervention program

DISCUSSION

The results showed significant differences before and after the implementation of the knowledge and prevention of anemia program in the study sample, thus finding that this intervention was effective.

This agrees with the study conducted by Garro [22], who demonstrated that educational programs were more effective as mothers' cognitive level and prevention practices of iron deficiency anemia and chronic malnutrition improved. This is different from the study by Oyos and Taipe [23], who found that parents did not know the importance of their children's nutrition and researched the quality of food their children should eat to improve their academic performance. Likewise, anemia is a multiple-etiology syndrome, where the levels of hemoglobin and red blood cells are reduced, and which, according to Gallego et al., damages the transportation of oxygen to the organs because iron deficiency affects hemoglobin synthesis, particularly in children under 3 years of age [27].

On the other hand, Huayaney [24] found the highest number of mothers that knew how to prevent anemia, most of whom agreed that children should be fed with iron-rich animal products, besides lentils, beans, peas and fava beans, at least three times a week. Dionisio [28] found that mothers' level of knowledge increased after the implementation of an educational intervention program, which agrees with this study that shows how effective these programs are to prevent anemia and with the study by Céspedes [29], which found that mothers' knowledge improved with a good educational intervention.

Mothers' knowledge and practices are essential to prevent anemia; however, such practices and knowledge are frequently influenced by uses, customs, beliefs and traditions of their culture, which lack scientific evidence and sometimes are associated with pediatric anemia [27,29,30].

Based on studies and results on the prevention of anemia, it is often developed due to mothers' lack of knowledge. As demonstrated from an educational and practical point of view, the peripheral pharmaceutical intervention improves mothers' knowledge about the prevention of anemia, which will allow them to better prevent anemia to take care of the health, development and growth of their children.

Part of the study limitations was the sample size. Although small, it was significant and allowed finding results that helped to verify the objectives of the study. Hence, such results helped us to understand the importance of carrying out educational activities or interventions for mothers to improve not only their knowledge but also their prevention practices of anemia.

In conclusion, it was determined that the pharmaceutical intervention program positively influences mothers' knowledge about the prevention of iron deficiency anemia in their children. It was demonstrated that the implementation of the program on parasitosis and good hygiene practices positively influences the prevention of

iron deficiency anemia. Furthermore, it was shown that the implementation of the program in the awareness of nutritious food choices and adequate management of micronutrients favors the prevention of anemia. Concerning the knowledge about medical control and pharmacological treatment of anemia, the educational program greatly improved mothers' level of knowledge.

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