THE CONTROL OF GROWTH AND DEVELOPMENT IN THE REDUCTION OF ANEMIA IN PERU

EL CONTROL DE CRECIMIENTO Y DESARROLLO EN LA REDUCCIÓN DE ANEMIA EN EL PERÚ

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ABSTRACT

Introduction: Anemia is a public health problem that mainly affects children under five years of age. **Objective:** Determine the impact of growth and development control (CRED) in reducing anemia in children under five years of age in Peru considering the analysis of the Demographic and Family Health Survey (ENDES) 2021. **Methods:** Analytical and cross-sectional study with a secondary analysis of data from the 2021 ENDES survey. **Results:** 31.4% of children under five years of age had anemia, where 38.3% corresponded to rural areas; 34.0%, male children; 56.9%, under one year old; 38.5% were mothers with primary education and 40.8% belonged to the index of the poorest, showing statistically significant differences. In relation to the CRED, it was evident that 32.4% of children who did undergo a CRED and 30.2% of children who did not had anemia. Regarding the place where it was carried out, it was observed that 32.4% of children who were cared for in a health facility and 32.9% of children who were cared for by the nurse had anemia. **Conclusion:** Anemia is a public health problem that is present and conditioned by various factors and determinants. During the pandemic, the impact of CRED in reducing anemia was ambiguous, so there are assumptions about whether the interventions are having the desired and expected impact.

Keywords: Prevalence; Anemia; Child development. (Source: MESH-NLM)

RESUMEN

Introducción: La anemia es un problema de salud pública que afecta principalmente a los niños menores de cinco años. **Objetivo:** Determinar el impacto del control de crecimiento y desarrollo (CRED) en la reducción de la anemia en niños menores de cinco años en el Perú considerando el análisis de la Encuesta Demográfica y de Salud Familiar (ENDES) 2021. **Métodos:** Estudio analítico y transversal. Con un análisis secundario de datos de la encuesta ENDES del año 2021. **Resultados:** El 31.4% de niños menores de cinco años tenía anemia; el 38.3% corresponde al área rural; 34.0%, a niños varones; 56.9%, a niños menores de un año; 38.5% de madres tienen educación primaria y 40.8% pertenece al índice de los más pobres; como se ve, las diferencias son estadísticamente significativas. En relación con el CRED, se evidenció que 32.4% de niños que sí se les hizo algún CRED y el 30.2% de niños que no, tenían anemia. En cuanto al lugar donde se realizó, se observó que 32.4% de niños que se atendían en un establecimiento de salud y el 32.9% de niños que fueron atendidos por la enfermera tenían anemia. **Conclusión:** La anemia es un problema de salud pública presente y condicionada a diversos factores y determinantes. Durante la pandemia, el impacto de CRED en la reducción de la anemia fue ambiguo, por lo que se tiene supuestos de si las intervenciones están teniendo el impacto deseado y esperado.

Palabras clave: Prevalencia; Anemia; Control de crecimiento y Desarrollo niño. (Fuente: DeCS- BIREME)

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INTRODUCTION

According to the World Health Organization (WHO), anemia is a condition in which the hemoglobin (Hb) value is lower than normal [1], 11 g/dl, in children under five years of age [2]. And as a consequence, various symptoms such as fatigue, weakness, drowsiness, dizziness, increased mortality, and exposure to infections can occur [3,4,1] especially in the first two years of life [3]. This mainly affects cognitive development [3,4], and even labor productivity as adults, which reduces earning potential and negatively affects national economic growth [1,5].

According to the WHO, when anemia exceeds 20%, it is a public health problem, which is why it is considered one of the main public health problems worldwide [2,3,4]; it is associated with the variables age, gender, ethnicity, maternal education and poverty index [6]. Worldwide, it is estimated that out of 273 million, approximately 42.6% of children under five years of age suffer from anemia [4,6], mainly in developing countries [7]. In Latin America, the prevalence is high in children under five years of age, due to the evident disparities in poverty, basic services and health [8]. In Peru, according to information from the National Institute of Statistics and Informatics (INEI), 38.8% of children under 36 months suffer from anemia; and the highlands are the most affected area with 49.8%, in addition to the fact that 50.2% of mothers are in the lowest quintile of poverty [9].

Anemia levels, at the national level, have decreased from 60.9% to 43.6% between 2000 and 2016. However, there was a stagnation between 41.6% and 43.6% between 2011 and 2016. Due to this problematic situation, the Peruvian health system proposes various measures for its prevention and control. Among them is the "National Plan for the Reduction and control of Maternal and child anemia and Chronic Child Malnutrition in Peru: 2017-2021", whose main objective is to reduce the prevalence of child anemia to 19% by 2021; in this, the adoption of healthy practices that contribute to better food and nutrition is promoted, for which the model of the Articulated Nutritional Program has been adopted and key interventions have been emphasized such as complete basic vaccinations, mainly rotavirus and pneumococcus and the Control of Growth and Development (CRED) through counseling and demonstrative sessions of food [10].

CRED is a periodic and systematic intervention of care of the child from the moment of birth, with the objective of identifying any change or risk in a timely manner in the evolution of the child's growth and health status [10,11]. In Peru, according to data from the Demographic and Family Health Survey (ENDES) it was evidenced that by 2016 58.3% of children under 36 months had CRED, and increased to 62.1% by 2019, with the percentage being higher in rural areas from 65.7% to 69.2% [12].

However, the onset of the pandemic caused by COVID-19 not only limited and affected society with the confinement, but also the health system, limiting the interventions and actions of health programs, either by fear of contagion in health facilities and the delay in patient care [13,14]. As a result, primary health care stopped offering services mainly for prevention and health promotion [15]. As evidenced by a study in which CRED coverages decreased in 2020 concerning 2019, from 91.2% to 35%, respectively [16]. And at the national level, the percentages were more worrisome since, by 2020, only 38.9% of children under 36 months had CRED [12].

Concerning CRED, no studies have been conducted on the impact on the reduction of anemia in children under five years of age, so we intend to develop a secondary analysis of the ENDES 2021 data to determine whether the higher the CRED coverage, the lower the prevalence of anemia or, conversely, the lower the CRED coverage, the higher the prevalence of anemia or none at all. For this reason, the need arose to study the impact of this type of intervention since this information will make it possible to evaluate continuity or improvement. The present study was developed with the initiative of finding out whether CRED has an impact on the reduction of anemia, since, according to the interventions and actions implemented, in accordance with the National Plan, the aim is to reduce anemia, as described in the conceptual model, which shows that the higher the CRED coverage, the lower the prevalence of anemia.

In this sense, the objective of this study is to determine the impact of CRED on the reduction of anemia in children under five years of age in Peru, considering the ENDES 2021 analysis.

METHODS
Study design
Analytical and cross-sectional study. A secondary analysis of the information contained in the ENDES 2021 database[9], and information collected by the INEI 2021 was developed. The impact of CRED on anemia in Peru in 2021 was analyzed.

Population, sample, and sampling
The population of this study consisted of children under five years of age residing in homes within the Peruvian territory. The statistical and cartographic information from the XII National Population Census and VII National Housing Census of 2017 was used to select the sample. The sample type was two-stage, probabilistic, balanced, stratified and independent, at the departmental level, by urban and rural area. The sample size was 36,760 households, grouped into 14,840 households in the headquarters area (departmental capitals and the 43 districts that make up Metropolitan Lima), 2,260 households in the rest of the urban area, and 12,660 households in the rural area. The sample distribution was estimated after evaluating the results obtained with the implementation of the ENDES surveys carried out from 2012 to 2020 and the design guidelines previously established for this purpose[17]. After filtering, 22,741 children under five years of age were taken from the ENDES database.

Inclusion and exclusion criteria
All children under five years of age of mothers interviewed in the field were included.
Children whose mothers were not interviewed in Module 1634 and 1638, were excluded.
Children who did not have data in the variable Hc57 were also excluded.
According to the aforementioned criteria, a final sample size of 20,614 children under five years old was obtained.

Variables
The study variables were taken from the data present in ENDES 2021. As the dependent variable: Anemia level

and development control was performed by: doctor (S466aa), obstetrician (S466ab), nurse (S466ac), nursing technician (S466ad), health promoter (S466ae), other (S466ax). They performed growth and development control (S466b); and as intervening variables: Area of residence (Hv025), Wealth index (HV270), sex (Hc27), age in months (Hc1), mother's highest educational level (HC61)[18].

Data collection techniques and instrument
The present investigation used a secondary data source collected by the household and individual questionnaire of the modules household characteristics (1629), housing characteristics (1630), weight and height - anemia (1638) and immunization and health (1634) of ENDES 2021(18) , which can be found at http://iinei.inei.gob.pe/microdatos/. Therefore, ENDES was the source that provided the information on the study variables for this research.

Analysis Plan
To collect the data, we accessed the INEI of Peru web page, followed by the microdata option, query by survey, and selected ENDES for the year 2021 with a single period. Subsequently, the files of the study variables were downloaded. We continued with the database merging of the four modules, and then debugged and left only the variables of interest and adjustment variables, the weighting factor (Hv005), stratum (HV022), and cluster number (NCONGLOME). The SPSS Statistics Data Document Version 25 statistical package was used for the statistical analysis. The data were estimated in point and relative frequencies, with weighted proportions considering complex sampling, with an analysis of the dependent and independent variable, through the Chi-square test.

Ethical aspects
The survey database provided by INEI is accessible to the general public, so the confidentiality of the participants was respected.

RESULTS
General aspects
For the analysis, 20,614 children from the different departments of Peru were included. The results show (Hc57) and as independent variables: She had any growth and development control (S466). The growth

that 67.9% of the children under five years of age were from urban areas and 32.1% from rural areas. According to sex, 50.7% corresponded to males and 49.3% to females; 3-year-old children predominated with 22.9%; 21.3% of 4-year-olds and 15% of children under 1 year of age. According to the mother's educational level, 66.1% had high school and only 1.2% corresponded to the item with no education. According to the wealth index, 30.3% were the poorest and 9.3% were the richest (Table 1).

Table 1. Characteristics of children under five years of age, according to area of residence ENDES-2021.

		Urban		Rural		Total	
		n	%	n	%	n	%
Sex	Total	13995	100	6619	100	20614	100
	Man	7124	50.9	3329	50.3	10453	50.7
	Woman	6871	49.1	3290	49.7	10161	49.3
	Total	13995	100	6619	100	20614	100
Age	< 1 year	2116	15.1	977	14.8	3093	15.0
	1 year	2860	20.4	1318	19.9	4178	20.3
	2 years	2897	20.7	1347	20.4	4244	20.6
	3 years	3185	22.8	1530	23.1	4715	22.9
	4 years	2937	21.0	1447	21.9	4384	21.3
Mother's educational level	Total	13703	100	6472	100	20175	100
	No education	66	0.5	185	2.9	251	1.2
	Primary	1361	9.9	2254	34.8	3615	17.9
	Secondary	9562	69.8	3782	58.4	13344	66.1
	Superior	2714	19.8	251	3.9	2965	14.7
Wealth index	Total	13995	100	6619	100	20614	100
	The poorest	1161	8.3	5088	76.9	6249	30.3
	Poor	4148	29.6	1232	18.6	5380	26.1
	Medium	3771	26.9	239	3.6	4010	19.5
	Rico	3015	21.5	50	0.8	3065	14.9
	Richer	1900	13.6	10	0.2	1910	9.3
Total		13995	67.9	6619	32.1	20614	100.0

Source: INEI - ENDES 2021

Growth and development control
According to Table 2, 56.2% of children under five years of age underwent a CRED, and 61% corresponded to rural areas.

Likewise, according to where the CRED was performed, 41.4% corresponded to a health post and 39.4% to a Minsa health center.

Table 2. Growth and development control of children under five years of age according to area of residence ENDES-2021.

		Urban		Rural		Total	
		n	%	n	%	n	%
Were given a CRED	Total	13995	100.0	6619	100.0	20614	100
	No	6429	45.9	2574	38.9	9003	43.7
	Yes	7546	53.9	4040	61.0	11586	56.2
	Do not know	20	0.1	5	0.1	25	0.1
Where CRED was held	Total	7546	100	4040	100	11586	100
	MINSA Hospital	464	6.1	190	4.7	654	5.6
	ESSALUD Hospital	358	4.7	167	4.1	525	4.5
	Hospital FF.AA. and PNP	9	0.1	2	0.0	11	0.1
	MINSA Health Center	3003	39.8	1558	38.6	4561	39.4
	MINSA health post	2980	39.5	1812	44.9	4792	41.4
	Polyclinic/Center/Posta/Polyclinic ESSALUD	287	3.8	131	3.2	418	3.6
	Hospital/Municipal Other	3	0.0	0	0.0	3	0.0
	Private clinic	288	3.8	115	2.8	403	3.5
	Private physician	104	1.4	45	1.1	149	1.3
	NGO Clinic/PostaHospital/	9	0.1	0	0.0	9	0.1
	Church Other	7	0.1	5	0.1	12	0.1
	Another	34	0.5	15	0.4	49	0.4

Source: INEI - ENDES 2021

According to Table 3, 48.7% of the health personnel who performed CRED on children under five years of were nurses.

Table 3. Health personnel who performed the CRED of children under five years of age, by area of residence ENDES-2021

		Urban		Rural		Total	
		n	%	n	%	n	%
Doctor	Total	13995	100	6619	100	20614	100
	No	13352	95.4	6392	96.6	19744	95.8
	Yes	623	4.5	222	3.4	845	4.1
	Do not know	20	0.1	5	0.1	25	0.1
Obstetrician	Total	13995	100	6619	100	21899	100
	No	13793	98.6	6508	98.3	21565	98.5

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	Yes	182	1.3	106	1.6	309	1.4
	Do not know	20	0.1	5	0.1	25	0.1
Nurse	Total	13995	100	6619	100	20614	100
	No	7494	53.5	3047	46.0	10541	51.1
	Yes	6481	46.3	3567	53.9	10048	48.7
	Do not know	20	0.1	5	0.1	25	0.1
Nursing Technician	Total	13995	100	6619	100	20614	100
	No	13631	97.4	6413	96.9	20044	97.2
	Yes	344	2.5	201	3.0	545	2.6
	Do not know	20	0.1	5	0.1	25	0.1
Health promoter	Total	13995	100	6619	100	20614	100
	No	13973	99.8	6612	99.9	20585	99.9
	Yes	2	0.0	2	0.0	4	0.0
	Do not know	20	0.1	5	0.1	25	0.1
Another	Total	13995	100	6619	100	20614	100
	No	13959	99.7	6608	99.8	20567	99.8
	Yes	16	0.1	6	0.1	22	0.1
	Do not know	20	0.1	5	0.1	25	0.1

Source: INEI - ENDES 2021

Anemia in children under five years of age

According to Table 4, the prevalence of anemia in children under five years of age was 31.4% and 22.9% corresponded to mild anemia.

According to area of residence, 38.3% were from rural areas, while 28.2% were from urban areas. According to sex, 34% of men and 28.8% of women had anemia. And according to age, 56.9% of children under one year of age had anemia, while only 15.9% of children under four years of age had anemia. Of these, there was a statistically significant difference (p<0.001).

According to the mother's educational level, 38.1% of children of mothers with primary education and 22.2% with higher education had anemia.

Likewise, according to the wealth index, 40.8% of the poorest compared to 17.5% of the richest with children under five years of age had anemia. There was a statistically significant difference (p<0.001) in these selected characteristics.

Table 4. Prevalence of anemia in children under 5 years of age by type of anemia according to selected characteristic ENDES-2021.

		Total, with anemia		Serious		Moderate		Slight		Without anemia		Total		Chi Square	Value of p
		n	%	n	%	n	%	n	%	n	%	n	%		
Area of residence	Total	6480	31.4	14	100.0	1750	100.0	4716	100.0	14134	68.6	20614	100.0	254,916	0.000*
	Urban	3946	28.2	6	42.9	960	54.9	2980	63.2	10049	71.8	13995	67.9		
	Rural	2534	38.3	8	57.1	790	45.1	1736	36.8	4085	61.7	6619	32.1		
Sex	Total	6480	31.4	14	100.0	1750	100.0	4716	100.0	14134	68.6	20614	100.0	82,134	0.000*
	Man	3552	34.0	11	78.6	1028	58.7	2513	53.3	6901	66.0	10453	50.7		
	Woman	2928	28.8	3	21.4	722	41.3	2203	46.7	7233	71.2	10161	49.3		
Age	Total	6384	31.4	14	100.0	1750	100.0	4716	100.0	14134	68.6	20614	100.0	2755,271	0.000*
	< 1 year	1760	56.9	7	50.0	666	38.1	1087	23.0	1333	43.1	3093	15.0		
	1 year	1860	44.5	5	35.7	585	33.4	1270	26.9	2318	55.5	4178	20.3		
	2 years	1198	28.2	1	7.1	223	12.7	974	20.7	3046	71.8	4244	20.6		
	3 years	967	20.5	0	0.0	170	9.7	797	16.9	3748	79.5	4715	22.9		
	4 years	695	15.9	1	7.1	106	6.1	588	12.5	3689	84.1	4384	21.3		
Mother's educational level	Total	6384	31.6	13	100	1730	100	4641	100	13791	68.4	20175	100	207,390	0.000*
	No education	84	33.5	0	0.0	26	1.5	58	1.2	167	66.5	251	1.2		
	Primary	1379	38.1	3	23.1	409	23.6	967	20.8	2236	61.9	3615	17.9		
	Secondary	4264	32.0	6	46.2	1126	65.1	3132	67.5	9080	68.0	13344	66.1		
	Superior	657	22.2	4	30.8	169	9.8	484	10.4	2308	77.8	2965	14.7		
Wealth index	Total	6480	31.4	14	100	1750	100	4716	100	14134	68.6	20614	100	624,607	0.000*
	The poorest	2547	40.8	7	50.0	773	44.2	1767	37.5	3702	59.2	6249	30.3		
	Poor	1821	33.8	4	28.6	489	27.9	1328	28.2	3559	66.2	5380	26.1		
	Medium	1095	27.3	1	7.1	251	14.3	843	17.9	2915	72.7	4010	19.5		
	Rico	683	22.3	2	14.3	171	9.8	510	10.8	2382	77.7	3065	14.9		
	Richer	334	17.5	0	0.0	66	3.8	268	5.7	1576	82.5	1910	9.3		
TOTAL		6480	31.4	14	0.1	1750	8.5	4716	22.9	14134	68.6	20614	100		

Source: INEI - ENDES 2021
* Significant

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According to Table 5, the prevalence of anemia in children under five years of age in relation to whether they had a CRED was 32.4% and in children who did not have a CRED was 30.2%, with a statistically significant difference (p<0.05).

And according to the place where the CRED was performed, there were no significant differences.

Likewise, it was observed that 32.4% of children treated in a health facility had anemia, as well as 35.6% of children treated in a hospital, 33.3% in a health center and 31.7% in a Minsa health post.

Table 5. Prevalence of anemia in children under 5 years of age by type of anemia in relation to whether they had a CRED ENDES-2021.

		Total, with anemia		Serious		Moderate		Slight		Without anemia		Total		Chi	Valor of P
		n	%	n	%	n	%	n	%	n	%	n	%	Square	
Growth and development control	Total	6480	31.4	14	100	1750	100	4716	100	14134	68.6	20614	100	14,791	
	No	2720	30.2	4	28.6	730	41.7	1986	42.1	6283	69.8	9003	43.7		0.022*
	Yes	3753	32.4	10	71.4	1020	58.3	2723	57.7	7833	67.6	11586	56.2		
	Do not know	7	28.0	0	0.0	0	0.0	7	0.1	18	72.0	25	0.1		
Where CRED was held	Total	3753	32.4	10	100	1020	100	2723	100	7833	67.6	11586	100		
	MINSA Hospital	233	35.6	1	10.0	58	5.7	174	6.4	421	64.4	654	5.6		
	ESSALUD Hospital	197	37.5	0	0.0	60	5.9	137	5.0	328	62.5	525	4.5		
	Hospital FF.AA. and PNP	1	9.1	0	0.0	0	0.0	1	0.0	10	90.9	11	0.1		
	MINSA Health Center	1519	33.3	4	40.0	427	41.9	1088	40.0	3042	66.7	4561	39.4		
	MINSA health post	1521	31.7	5	50.0	412	40.4	1104	40.5	3271	68.3	4792	41.4		
	Polyclinic/Center/Posta/Polyclinic ESSALUD	105	25.1	0	0.0	21	2.1	84	3.1	313	74.9	418	3.6	42,496	0.124
	Hospital/Municipal Other	0	0.0	0	0.0	0	0.0	0	0.0	3	100.0	3	0.0		
	Private clinic	108	26.8	0	0.0	28	2.7	80	2.9	295	73.2	403	3.5		
	Private physician	46	30.9	0	0.0	8	0.8	38	1.4	103	69.1	149	1.3		
	NGO Clinic/Posta	2	22.2	0	0.0	1	0.1	1	0.0	7	77.8	9	0.1		
	Hospital/Church Other	5	41.7	0	0.0	1	0.1	4	0.1	7	58.3	12	0.1		
	Another	16	32.7	0	0.0	4	0.4	12	0.4	33	67.3	49	0.4		

Source: INEI - ENDES 2021
* Significant

And, finally, according to Table 6, there were no significant differences in relation to the health personnel who performed the CRED, except in the CRED performed by the nurse where 32.9% had anemia, and a statistically significant difference was evidenced (p<0.001).

Table 6. Prevalence of anemia in children under five years of age by type of anemia in relation to the health personnel who carried out the CRED ENDES-2021.

		Total, with anemia		Serious		Moderate		Slight		Without anemia		Total		Chi Square	p
		n	%	n	%	n	%	n	%	n	%	n	%		
Doctor	Total	6480	31.4	14	100	1750	100	4716	100	14134	68.6	20614	100	7,738	0.258
	No	6235	31.6	14	100.0	1690	96.6	4531	96.1	13509	68.4	19744	95.8		
	Yes	238	28.2	0	0.0	60	3.4	178	3.8	607	71.8	845	4.1		
	Do not know	7	28.0	0	0.0	0	0.0	7	0.1	18	72.0	25	0.1		
Obstetrician	Total	6480	31.4	14	100	1750	100	4716	100	14134	68.6	20614	100	5,163	0.523
	No	6383	31.4	14	100.0	1719	98.2	4650	98.6	13918	68.6	20301	98.5		
	Ye	90	31.3	0	0.0	31	1.8	59	1.3	198	68.8	288	1.4		
	Do not know	7	28.0	0	0.0	0	0.0	7	0.1	18	72.0	25	0.1		
Nurse	Total	6480	31.4	14	100	1750	100	4716	100	14134	68.6	20614	100	24,265	0.000*
	No	3164	30.0	5	35.7	843	48.2	2316	49.1	7377	70.0	10541	51.1		
	Yes	3309	32.9	9	64.3	907	51.8	2393	50.7	6739	67.1	10048	48.7		
	Do not know	7	28.0	0	0.0	0	0.0	7	0.1	18	72.0	25	0.1		
Nursing Technician	Total	6480	31.4	14	100	1750	100	4716	100	14134	68.6	20614	100	6,235	0.397
	No	6312	31.5	13	92.9	1714	97.9	4585	97.2	13732	68.5	20044	97.2		
	Yes	161	29.5	1	7.1	36	2.1	124	2.6	384	70.5	545	2.6		
	Do not know	7	28.0	0	0.0	0	0.0	7	0.1	18	72.0	25	0.1		
Health promoter	Total	6480	31.4	14	100	1750	100	4716	100	14134	68.6	20614	100	3,967	0.681
	No	6471	31.4	14	100.0	1749	99.9	4708	99.8	14114	68.6	20585	99.9		
	Yes	2	50.0	0	0.0	1	0.1	1	0.0	2	50.0	4	0.0		
	Do not know	7	28.0	0	0.0	0	0.0	7	0.1	18	72.0	25	0.1		
Other	Total	6480	31.4	14	100	1750	100	4716	100	14134	68.6	20614	100	6,803	0.339
	No	6467	31.4	14	100.0	1746	99.8	4707	99.8	14100	68.6	20567	99.8		
	Yes	6	27.3	0	0.0	4	0.2	2	0.0	16	72.7	22	0.1		
	No Do not know	7	28.0	0	0.0	0	0.0	7	0.1	18	72.0	25	0.1		

Source: INEI - ENDES 2021
* Significant

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DISCUSSION

Anemia in children under five years of age

Anemia is a public health problem that not only affects Peru but also several countries in the world. It mainly affects children, who are the most vulnerable group negatively, since it has serious consequences [19], affecting even the growth and cognitive development of children [20]. It has been shown in various investigations that the prevalence of anemia is worrying and alarming since it carries a great risk in the development of the country [21].

According to the results found in the study, anemia in children under five years of age is 31.4%; according to the type of anemia, 0.1% is severe, 8.5% is moderate and 22.9% is mild. In studies conducted in other countries, there are similar data, among which is the one conducted by Kebede et al.[22], who found a prevalence of 48.9% of anemia: 25.0% was mild and, in contrast, 15.8%, moderate and 8.2%, severe. In contrast, a study conducted in Brazil by Dos Santos et al.[23], estimated a prevalence of anemia of 56.6%. It is evident that anemia is a serious public health problem in our country that affects children under five years of age.

In addition, a higher concentration of anemia prevalence was observed in children living in rural areas at 38.3% compared to urban areas at 28.2%; several studies agree with this result, such as Moyano et al.[19] who mentions that anemia is mainly related to living in a rural area. In his study of Ecuadorian children, he found that 67.3% of children living in rural areas and 32.7% living in urban areas had anemia, with a statistically significant difference (p<0.05). With this, it can be assumed that the disparity is very critical in the provision of health services in rural areas, since it is limited by lack of resources, geographic accessibility, among others.

Likewise, Moyano et al.[19] report that the prevalence of anemia is higher in boys than in girls, which may be related to the absolute physical growth of boys compared to girls. According to the results found, this s are high compared to the rest of the age groups.

reference can be evidenced where 34.0% of boys compared to only 28.8% of girls. It is worth mentioning that, according to Puente et al.[24], the sex variable is an associated factor, but not a risk factor, as well as the fact that boys are more likely to have anemia than girls.

Li H et al.[25] identified that, in the six to 11 months age group, the prevalence of anemia was the highest with 22.3%, which we can contrast with the results obtained in the study, which shows that 56.9% of children under one year of age have anemia, being the highest value compared to the other age groups. In a study conducted by Li S et al.[26] in China, also, it was evidenced that the prevalence of anemia among children from zero to 23 months was high with 22.15%; in another study, Mboya et al.[27] mentioned that it is a problem mainly in children from six to 23 months; the results found in the study are related to these studies, as shown in the group of children under one year and one year old, the percentage

According to the other selected characteristics, the level of education of the mother has statistically significant differences, since it was found that children of mothers with no education or only primary and secondary education have anemia in 33.5%, 38.1% and 32.0%, respectively, in contrast to mothers with higher education who have only 22.2% of anemia. According to Al et al.[28], the prevalence of anemia is 40% more frequent when the mother has a primary education or no education at all; in addition, she mentions that children of mothers with higher levels of education consume more protein and iron from animal sources. Thus, it can be inferred that the prevalence of anemia decreases with the increase in the mother's educational level and that it could be related to better healthy practices.

Al et al.[28], mentioned that the poorest and poorest wealth indexes were found to have 23% and 19%, respectively, more prevalence of suffering from anemia than the average index, in addition to the richest and richest indexes having protective factors. According to the results obtained, it is observed that 40.8% of the

poorest, 33.8% of the poorest, 27.3% of medium index, 22.3% of the richest and 17.5% of the richest show that there is a significant difference, since the lower the wealth index, the higher the prevalence; as mentioned by Vasquez et al. [29], low socioeconomic status, low educational level, among others, are factors associated with the prevalence of anemia, so this characteristic has implications for the quality and timeliness of access to health care, as well as nutritious food.

Anemia and credit in children under five years of age
Since the beginning of the pandemic, the health difficulties in the world have been evident and Peru is no stranger to this. As a result, the different health problems were not addressed as stipulated[29].

According to ENDES, in 2021, 43.7% of children did not receive a CRED, and only 56.2% received a CRED. This could be due to the decrease in coverage during the pandemic, as they may not have attended health facilities for fear of contagion and the delay in patient care. According to the results obtained, 32.4% of children under 5 years of age have anemia even though they had CRED and 30.2% of children who did not have CRED also have anemia. Therefore, it can be assumed that CRED is not being as effective as one of the key interventions proposed in the National Plan or that the quality of CRED implementation is not adequate.

This is also supported by the results found in relation to the place where the CRED of children under five years of age was performed; according to this, 35.6%, 33.3% and 31.7% that are performed in a hospital, health center and Minsa health posts, respectively, have anemia. To this, Vasquez et al.[29] supported the hypothesis of whether the policies have been based on scientific evidence, since even after implementing the interventions proposed by the State, the prevalence of anemia does not decrease. In spite of this, the relationship between anemia and the place where the CRED was carried out was not found to be significant. In a study conducted by Mansilla et al.[30], it was shown that the Strategy for Comprehensive Growth and Development has a significant effect on anemia. It also mentions that the educational and follow-up components could be of great help in combating anemia. According to the results obtained, 48.7% of children under 5 years of age are monitored by the

nurse, who is responsible and has the function of developing the CRED according to Minsa regulations[31]; however, of these, 32.9% have anemia. It can be assumed that the CRED care provided is not of high quality or that the professional is not adequately trained to provide care, so it does not imply a change in the reduction of anemia.

Diaz[15] believes that the pandemic is what may increase the prevalence of anemia, but that cases can be reversed with multidisciplinary interventions in health, education, labor and economy. However, Vasquez et al.[29] mentioned, in their analysis, that, despite the fact that national surveys show that preventive and therapeutic treatment of anemia decreased, the percentages of anemia prevalence did not increase during the pandemic, and referred that this maintains similar values to the year 2019, suggesting that anemia is not iron deficient. In addition, Zavaleta[32] mentions that several studies have shown that the prevalence of anemia in the last five years has not changed, which constitutes a challenge to carry out a comprehensive work on children under five years old that involves the government, the family and the community.

ENDES is one of the most representative surveys at the national level, since it provides a database of household characteristics as well as family health; however, the present study presented factors that limited the research. First, the study's cross-sectional design does not allow establishing a cause-effect relationship. Finally, since it was a database for a secondary study, only the convenient variables from the ENDES questionnaire were used to develop the study. However, the findings are sufficiently solid to justify an immediate review of current policies and interventions related to anemia and CRED, taking into account the area of residence and socioeconomic factors.

In conclusion, anemia is a public health problem conditioned to various factors and determinants: rural residence area, children under two years of age, low educational level of mothers and low wealth index. According to the results found, CRED has a significant relationship with the prevalence of anemia; however, the impact of CRED on the reduction of anemia is neither negative nor positive, it is ambiguous, According to ENDES 2021 data. And this is corroborated

by the presence of the pandemic, in which many of the interventions related to the National Plan for the reduction of anemia were limited, including CRED. According to some authors, the prevalence of anemia did not increase, so they have assumptions about whether the State's strategic interventions are having the desired and expected impact and whether they are based on scientific evidence. Despite several State initiatives, the efforts have not been sufficient to reduce the prevalence of anemia [33], since, according to the study developed, there is no evidence of this. Finally, the findings suggest an immediate intervention by the health governing body and the State to improve the quality of appropriate CRED care practices for children under five years old in health facilities.

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