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Prevalence and Epidemiological Aspect of Iron-Deficiency Anemia in Children Aged 7-24 Months at HGR-Kindu

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ABSTRACT

This is a public health problem, because of a total of 546 infants aged 7 to 24 months, anemic explored, and 38.1% had iron deficiency anemia; 40.3% iron deficient without anemia and 21.6% of non-deficient anemic infants based on the following indicators: Hb < 11g/dl; VGM < 74 fl and low serum iron < 37ug/dl. Among the risk factors observed in this study: age (7-12 months), low level of education of mothers, large household size in relation to household income and early and late partial weaning with food supplements not suitable. This study tends to show the major place of sociodemographic factors in the genesis of iron deficiency anemia in our environment and especially the role that breastfeeding plays in avoiding the early onset of iron deficiency anemia in children.

Introduction

Iron deficiency is considered by the WHO to be the most widespread isolated nutritional deficiency in the world, affecting more than 2 billion people, or 15% of the world's population (Le Gall E, 2000; Boudjerra N, 2005). Infants aged 6 to 36 months pay the heaviest price for nutritional anemia due to iron deficiency (Folquet AM, 2007).

The prevalence of iron deficiency anemia varies considerably from region to region and between less developed and more developed countries (De Maeyer and Adiels-Tegman, 1985). A study carried out in France by Gal (2000) showed the existence of iron deficiency anemia more widespread in children born to immigrant parents with a prevalence of 23% at 2 years and 4% at 4 years, compared to children born to metropolitan French parents in 8.3% and 0.3% respectively. In Chad, a study conducted in Moundou, in 141 anemic children aged less than one year; 22.7% of the explored cases presented an iron deficiency (Renaudin P et al, 1994).

Given that children with iron deficiency anemia are often observed in less favorable socio-economic situations and that there are anemias of other origins within the same population, it is important to know the epidemiological factors of the iron deficiency anemia in a region, depending on the population and its socio-economic situation; This is to better ensure good prevention and appropriate treatment.

The study presentation essentially has three objectives, namely:

- To determine the prevalence of iron deficiency anemia in infants aged 6 to 24 months during the study period.
- Identify the epidemiological profile of infants with iron deficiency anemia,
- Know the relationships that may exist between iron deficiency anemia and the factors that determine its frequency.

Patients method

Our study population consisted of 428 deficient infants aged 6-24 months with or without anemia. Were considered cases of iron deficiency anemia, infants who had presented palmar pallor and in whom Hb<11g/dl; VGM<74 and a low serum iron level< 37micrograms per dl.

Cases of anemia without iron deficiency were excluded from our study.

Our investigations took place at the HGR-K, department of pediatrics during the period from January 1 to December 31, 2011. This is a prospective study with observation and interview technique guided by an established survey protocol. beforehand (see appendix).

Venous blood samples (ml) were taken from a superficial vein of the elbow crease or from the jugular vein after careful cleaning of the skin. Single-use equipment assumed to be sterile was used.

Study parameter

- Prevalence;
- Age in months of children;
- Gender of children;
- Daily consumption per person (CJI) in dollars;
- Level of education of the mother (NIM);
- Duration of exclusive breastfeeding (AME);
- Porridge quality at partial weaning.
- Statistical analysis of data.

Results

The counting and analysis of 546 data collection sheets led to the results distributed in the tables below:

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1. Prevalence

Table 1. Distribution of iron deficiency and anemia in infants aged 6-24 months.

Anemia		N	%
ID+A	(serum iron< 37ug %)	208	38.1
ID-A	(serum iron 37-100ug %)	220	40.3
No deficiency	(serum iron> 100ug%	118	21.6
Total		546	100ug%

The 208 deficient infants with anemia (ID+A) found out of the total number of 546 anemic infants checked and aged 7 to 24 months represent a prevalence of 38.1%; compared to 40.3% of deficient infants without anemia (ID-A) and 21.6% of anemic infants without iron deficiency.

2. Iron deficiency anemia and age

Table 2. Frequency of iron deficiency anemia according to age

Iron deficiency	with anemia		without anemia		
Age (in month)	n	%	n	%	T ( )
7-12	95	22.2	141	32.9	236
13-18	62	14.5	35	8.2	97
19-24	51	11.9	44	10.3	95
TOTAL	208	48.6	220	51.4	42

The results in Table 2 show a higher frequency of deficient infants with anemia (22.2%) compared to other age groups. The difference observed statistically is significant (p<0.05%). The risk of iron deficiency anemia for infants aged 7-12 is 22.2%.

Chi square=16.67, p=0.0002

3. Iron deficiency anemia and sex

Table 3. frequency of iron deficiency anemia according to sex

Iron deficiency		with anemia		without anemia	
Sex	n	%	n	%	T
Male	96	22.4	117	27.3	213
Female	112	26.2	103	24.1	215
TOTAL :	208	48.6	220	51.4	428

In this table 3 in relation to sex, there is a slight predominance of female infants with iron deficiency anemia (26.2%) over males (22.4%). The statistical difference between the two sexes is not significant (p>0.05%). Iron deficiency anemia is not sex-linked at this age.

Chi square=2.11; p=0.15

4.Iron Deficiency Anemia and Sociodemographic Factors

Table 4. daily consumption per individual (D.C.I) in dollars.

Iron deficiency		with anemia		without anemia		
D.C.I in dollars		n	%	n	%	T
Very insufficient	($< 1)	134	31.3	155	36.2	289
Insufficient	($1-2)	72	16.8	49	11.5	121
Sufficient	($3-5)	2	0.5	16	3.7	18
Total		208	48.6	220	51.4	428

The daily consumption per individual takes into account the value of the household basket (hemelea) and the size of the household.

We see in this table that the majority of deficient infants with anemia come from households whose DCI is very insufficient (31.3%) against only 0.5 cases of iron deficiency anemia observed in households with sufficient DCI. The difference observed statistically is significant (p<0.05%).

Chi square=16.40; p=0.000266

Table 5. Educational levels of mothers (ELM)

Iron deficiency	with anemia		without anemia		
ELM	n	%	n	%	T
Level 1	69	16.1	25	5.9	94
Level 2	82	19.1	41	9.6	121
Level 3	57	13.3	154	36	211
Total	208	48.5	220	51.5	428

Level 1 is equivalent to illiteracy, level 2 = primary school and level 3 = secondary or higher.

The objective of the study of the level of education in our survey is to appreciate the ability of the mother not only to answer the questions asked but above all to understand a message concerning a subsequent health education.

The results of this table 5 reveal that deficient infants with anemia from mothers of level 3 were few (13.3%) compared to those of mothers of level 1 (16.1%) and level 2 (19, 1%). The observed difference is significant (p<0.05%).

Chi square= 78.58; p=0.000

5. Duration of EB and quality of DS (Dietary Supplement) given to infants at the time of their partial weaning.

Table 6. duration of exclusive breastfeeding (EB)

Iron deficiency		with anemia		without anemia	
EB duration (months)	n	%	n	%	T
< 6	142	33.2	117	27.3	259
=6	2	0.5	29	6.8	31
> 6	64	14.9	74	17.3	138
Total	208	48.6	220	51.4	428

In this table 6, relating to the duration of exclusive breastfeeding, it is constant that the incidence of iron deficiency with anemia is higher in infants who have experienced an early introduction of new foods (6 months) with 33, 2% followed by those exclusively breastfed at the age of 6 months (14.9%) against only 0.5% of anemic infants, breastfed exclusively for 6 months, in accordance with WHO recommendations.

The observed difference is statistically significant (p<0.05%)

Chi square= 26.34; p=0.0000

Table 7.Quality of food supplement (DS) given to infants at the time of their partial weaning Iron deficiency with anemia without anemia

Iron deficiency	with anemia		without anemia		
D.S.	n	%	n	%	T
Not suitable	193	45.1	152	35.5	345
Suitable	15	3.5	68	15.9	83
Total	208	48.6	220	51.4	428

The results in Table 7 show that the number of anemic infants who received the adapted food supplement (AFS= Adapted Food Supplement) with 3.5% is far lower than those who received the unsuitable food supplement (45.1%) at the time of their birth. partial weaning. The observed difference is statistically significant (p<0.05). Chi square= 38.41; p=0.000.

Table 8. Frequency of hookworm infection associated with iron deficiency anemia

Iron deficiency	with anemia		witout anemia		
Hookworm	n	%	n	%	T
+	51	11.9	44	10.3	95
-	157	36.7	176	41.1	333
Total	208	48.6	220	51.4	428

In this table 8, we note that the frequency of hookworm infection observed in infants with iron deficiency anemia (11.1%) is slightly higher than that observed in infants without iron deficiency anemia (10.3%): The difference observed is not statistically significant (p>0.05%). Chi square= 1.26; p=0.26.

Comments

Prévalence (Tab.1)

The results of this table reveal that 208 infants presented with iron deficiency anemia (serum iron < 37µg/dl) out of the

total number of anemic infants, i.e. prevalence of 38.1%; against 40.3% of deficient infants without anemia and 21.6% without deficiency.

This prevalence of 38.1% of infants with iron deficiency anemia is of the same order as that observed during a national nutrition survey conducted by Mohamed et all (2002), it is higher than that found in Chad (Mondou) by 22 7% in a hospital environment like ours, Pediatrics department.

Canadian studies have recently identified a number of high-risk groups; Among the main risk factors identified: Low socio-economic level and problem of food bioavailability (HAS, 2011).

With us, it is due more to the low CSE of the population and to the non-accessibility of foods rich in bioavailable iron during our period of study characterized by this period of armed conflict that our Province of Maniema experienced.

Age and sex

The results in Table 2 showed a higher frequency of infants with iron deficiency anemia in the age group ranging between 6 and 12 months of 22.2% compared to the other age groups; The difference observed statistically is significant ($p<0.05\%$).

According to the WHO (2008), iron deficiency is particularly frequent during the first two years of life, during which its main cause is an insufficient intake of bioavailable iron to meet the important needs for growth;

The American Academy of Pediatrics considers infants 6-12 months of age as a high-risk group and recommends early screening for them compared to those 15-18 months of age ( );

A study carried out in Europe has shown that infants tested at 6 months not deficient develop iron deficiency anemia only at the age of 12 to 18 months (Maja Beck Popovic, 2006);

Le Gall in his study conducted in France (2000) showed that the frequency of iron deficiency decreases with age with a peak at the age of 10 months (22);

The results of the national nutrition survey (INNTA, 2002) showed prevalence of 38% in children aged 6 months to 2 years, very close to those observed in our study of 38.1%;

A study conducted by Adebo et al in southern Benin (2018) showed that the main cause of anemia was due to the deficiency of available organic iron, especially in infants aged 6-18 months.

An important element observed in our study is the poor diversification of foods in infants from the age of 5 to 6 months; Indeed, poor food diversification at this age is an important factor limiting the duration of iron reserves in infants. In fact, in NB (New Born) at term, the danger of iron deficiency anemia is frequently observed only between 6 months and 24 months following the decrease in iron reserves after the age of 6 months. A good food diversification should make it possible to double this stock at the age of one year and to quadruple at 3 years (Malgorzata P, 2004). A study by Popovic MB (2006) showed that non-deficient infants tested at 6 months develop iron deficiency anemia only at the age of 12 to 18 months. This shows that the very early onset of iron deficiency anemia observed in our study between 6 and 12 months could be due to poor food diversification as shown by the results in Tables 6 and 7.

- Sex (Tab.3)

In this table 3 in relation to gender, there is a slight predominance of girls with iron deficiency anemia of 26% compared to boys 22.4%; But statistically the difference is not significant ($p>0.05\%$). Iron deficiency anemia in infants aged 6-24 months is not sex-linked. Indeed, according to data from the literature, both sexes are equally affected in children ();

For this, the recommended nutritional intake of iron for the French population is not influenced by gender, regardless of gender, until the age of 13 (Dionne J.I, 2011). But in relation to age, young children have high iron needs due to their growth; the same is true for women of childbearing age who have high iron requirements to compensate for physiological losses due to menstruation.

- Sociodemographic factors (Tab.4 and 5).

It was noted in the results of this table 4, that the majority of infants with iron deficiency anemia come from households with very insufficient CJI 31.3%, against only 0.5% for households with sufficient CJI. The observed difference is highly significant ($p<0.05\%$). These findings have also been found in several studies conducted around the world and in particular in Africa.

In France, iron deficiency with anemia is more common in children born to immigrant parents compared to those born to French metropolitan parents (Le Gall E, 2001).

Canadian studies have also shown that iron deficiency anemia is more common in certain high-risk groups, including socio-economically disadvantaged and/or poorly educated people (Feigther JW, 1993-Guy B, (1974).

According to a study carried out in Montreal with nearly one-year-old children in the five poorest health districts, 15% of the subjects had a hemoglobin level lower than 10.5g/dl and 27% a level lower than 11g/dl. dl(37).

In our study, the CJI is very insufficient by the majority of households with anemic children (31.3%), during this period characterized by armed conflicts in our province of Maniema (DRC). These unfavorable socio-economic conditions of the parents would be the basis of the fairly regular non-consumption of foods rich in iron, bioavailable at household level such as meat, fish, poultry, etc. On the other hand, the financial difficulties linked to the conditions unfavorable socio-economic status alone cannot explain the high frequency of iron deficiency anemia in our environment;

There is also the low level of education of the mothers who do not manage to understand the importance of the educational messages, therefore not finding the time necessary to go regularly with their children to the CPS;

Duration of breastfeeding and quality of food supplement adapted or not adapted with age (Tab.6 and 7).

The results in Table 6 showed a very low frequency of cases of iron deficiency anemia in children fed exclusively breast milk during the first 6 months of their lives in accordance with WHO recommendations (0.5%) compared to those exclusively breastfed until beyond 6 months (14.9%) and an even higher frequency of cases of anemia for those who experienced an early introduction of new foods before 6 months (33.2%).

The few data that do exist suggest that breastfeeding may reduce the risk of anemia, although not to a degree comparable to that found in breastfed children supplemented with iron-fortified cereals after the age of 4-6 months, nor to that recorded in children who have been fed iron-fortified milk formula (De Maeyer et al; Feightner J.W., 1996). Thus the WHO recommends cow's milk, but also for other reasons such as the prevention of infections (Berman et all,).

Cow's milk is currently very little used in our environment, especially in disadvantaged CSE households given the high cost of the latter; During our study, no infant

benefited from cow's milk. One of the major drawbacks of cow's milk, when consumed in large quantities, can cause chronic intestinal blood loss in infants through ingestion of its heat-labile proteins ( ).

In our study (Tab.7), the majority of children with iron deficiency anemia 45.1% benefited from an unsuitable food supplement based on cassava flour, banana, biscuit,... compared to only 3.5% of infants anemic who have benefited from an adapted food supplement (AFS), as recommended by the WHO (corn and soya) from the age of 6 months.

Frequency of ankylostomiasis associated with iron deficiency anemia (Tab.8).

In our study, hookworm infection was associated with iron deficiency anemia with a fairly low frequency of 11.9% against 10.3% of infants without anemia. The difference is not significant ($p>0.05$).

According to the literature (Gentillini M,), the intensity of iron deficiency anemia caused by hookworm infection depends on several factors;

The number and species of worms. It is rare to observe symptoms for less than 50 and even 100 worms; From 500 to anemia becomes inevitable.

Age and nutritional status (iron). Hookworm infection is rare in infants, but common between 2 and 5 years of age.

Dietary iron intake; If the diet is high in iron, it will take enough necator to cause anemia.

The duration of the infestation and associated infections; Anemia will only set in after depletion of iron reserves (around 1g) which may take several months.

In Togo (Lomé), as in other African countries, moderate parasites no longer represent a risk factor for anemia or iron deficiency. In our case, this low frequency of ankylostomiasis observed would be related to chemoprophylaxis with mebendazole through the extended vaccination program (EPI).

Conclusion and Recommendation

Our study focused on the prevalence and epidemiological aspect of iron deficiency anemia in infants aged 6 to 24 months at the HGR-K from January 1 to December 31, 2011. It allowed us to correct 428 cases of iron deficiency with and without anemia.

At the end of this study, it appears that:

The fairly high frequency of iron deficiency anemia observed at 38.1% constitutes a real health problem, especially in the age group of 7 to 12 months;

This study also showed that iron deficiency anemia at this age affects both sexes indiscriminately;

Among the factors favoring iron deficiency anemia observed in our series: the low level of education of mothers and the large size of households in relation to household income; In addition, the poor diversification of foods could be the basis of the early onset of iron deficiency anemia observed in infants at the age of 7 to 12 months.

The ideal would be to provide infants with a natural food supplement (NDS) rich in iron and vitamin C, specifically the case of cassava leaf juice and lemon (malizane) from the age of 6 months, without forgetting the promotion of breastfeeding in accordance with WHO recommendations.

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