



ISSN: 0975-833X

Available online at <http://www.journalcra.com>

INTERNATIONAL JOURNAL
OF CURRENT RESEARCH

International Journal of Current Research

Vol. 16, Issue, 04, pp. 27796-27801, April, 2024

DOI: <https://doi.org/10.24941/ijcr.46992.04.2024>

RESEARCH ARTICLE

DETERMINANTS OF ANEMIA IN CHILDREN AGED 6-59 MONTHS IN NIGER IN 2022.

^{1,*}Ali Zaratou, ²Adamou Issa Ali, ³Ali Hadiza, ⁴Attinine Soumana Aissa and ⁵Daouda Saley

¹Department of Public Health, Faculty of Health Sciences, Abdou Moumouni University, Niamey, Niger; ²Nutrition Unit, National Institut of Statistic, Niamey, Niger; ³Ministry of Public Health and Social Affairs, Reproductive Health; ⁴Medical Nutritionist, Faculty of Agricultural Sciences, Abdou Moumouni University, Niamey, Niger; ⁵Medical Nutritionist, Ministry of Public Health and Social Affairs, Niamey, Niger

ARTICLE INFO

Article History:

Received 20th January, 2024

Received in revised form

19th February, 2024

Accepted 15th March, 2024

Published online 17th April, 2024

Key words:

Anemia, Children, 6 to 59 months, Determinants, 2022, Niger.

*Corresponding author:

Ali Zaratou

Copyright©2024, Ali Zaratou et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Citation: Ali Zaratou, Adamou Issa Ali, Ali Hadiza, Attinine Soumana Aissa and Daouda Saley, 2024. "Determinants of anemia in children aged 6-59 months in Niger in 2022.". *International Journal of Current Research*, 16, (04), 27796-27801.

ABSTRACT

Context: The prevalence of anemia among children aged 6 to 59 months in 2020 in Niger was 63.3%, well above the critical threshold of 40% defined by the World Health Organization. The aim of the study was to identify risk factors for anemia in children aged 6-59 months in Niger in 2022. **Methods:** This was a descriptive and analytical cross-sectional study. Data collected from August 20 to September 27, 2022 on children aged 6 to 59 months whose hemoglobin levels were measured constituted the study population. Risk factors for the occurrence of anemia were identified by binary logistic regression. A p-value of less than 0.05 was considered significant. **Results:** A total of 3969 children aged 6-59 months were included in the study. The prevalence of global anemia was estimated at 57%. After logistic regression, the risk factors for the occurrence of anemia were: age group 6-23 months (OR: 2.38; 95% CI: 2.05 - 2.72), fever in the 14 days preceding the survey (OR: 1.43; 95% CI: 1.06 - 1.92), stunting (OR: 1.52; 95% CI: 1.10-2.11) and weaning from breastfeeding before 23 months (OR: 2.19; 95% CI: 1.56-3.06); while the absence of underweight with an OR: 0.68 <1 protected children from anemia. **Conclusion:** This work identified the factors that influenced the occurrence of anemia in children aged 6-59 months. Prevention involves interventions on identified factors that are modifiable.

INTRODUCTION

Anemia is a worldwide public health problem resulting from nutritional iron deficiency. It is characterized by a drop in hemoglobin levels in the blood below the reference values defined by the World Health Organization (WHO), which depend not only on gender and age, but also on a person's morphological condition (1). It particularly affects children aged 6 to 59 months and women of childbearing age (15 to 49). Poor maternal nutrition during pregnancy and after childbirth contributes to morbidity in children under five, weakening the body and exposing children to all forms of illness, including iron-deficiency anemia. Other infectious diseases can also cause childhood anemia, including malaria (2). Anemia can also have a major impact on children's physical and cognitive development, as well as on adults' productivity in the workplace (3). It is estimated that 269 million children under the age of five and over 500 million women of childbearing age will suffer from anemia worldwide in 2019, representing a global prevalence of 39.8% for children under the age of five and 29.9% for women of childbearing

age. Children under five living in African countries are the most affected by anemia, with a prevalence of 60.2% in 2019 (4), well above the 40% emergency threshold defined by the World Health Organization (1). In 2019, Yemen is the first country in the world affected by infantile anemia, followed by Mali with respective prevalence's of 79.5% and 79%, and Niger occupies 10th place worldwide with a prevalence of 72%, whereas it occupied 3rd place worldwide in 2000 with a prevalence of 83.9%, behind Burkina Faso and Mali, which occupied the top two places worldwide (4). World Health Organization data show a reduction in the prevalence of childhood anemia of 11.9 percentage points in Niger over the past 19 years (5). Nevertheless, in 2021, 71.8% of children under the age of five in Niger were affected by anemia, including 27.2% in the mild form, 40.1% in the moderate form and 4.4% in the severe form (6). All these forms of anemia, with the exception of the severe form, present prevalence rates that testify to the existence of a public health problem in accordance with the standards established by the WHO (1). Hence the interest of this study, whose objective was to identify the risk factors for anemia in children aged 6 to 59 months in Niger in 2022.

MATERIALS AND METHODS

This was a descriptive and analytical cross-sectional study. The data used came from the national cross-sectional nutrition survey based on Niger's SMART (Standardized Monitoring and Assessment of Relief and Transition) methodology, in 2022. The survey was conducted nationwide, with regional representativeness for the 7 regions (Agadez, Diffa, Maradi, Tahoua, Tillabéry, Zinder and Niamey) and departmental representativeness for all departments in the Dosso region. Data collection took place from August 20 to September 16, 2022 in the seven (7) regions and from September 2 to 27, 2022 in the Dosso region. The study population consisted of children aged 6 to 59 months. All children aged between 6 and 59 months whose hemoglobin levels had been determined (usual residents or visitors) and who were in the household at the time of the survey were included. A total of 10765 households were surveyed in the 620 clusters sampled. And the sample for this study was a sub-population consisting essentially of 3969 children aged 6 to 59 months, for whom hemoglobin levels were measured.

Detailed information on the survey sample, methodology and data processing is published in the SMART Survey report at: [RAPPORT_SMART_Niger_2022_VF.pdf](#) (stat-niger.org). In this study, the dependent variable was the occurrence of anemia in children aged 6 to 59 months. Designed in accordance with WHO standards, it was based on hemoglobin test values collected using a device called Hemocue. It had 2 modalities: absence of anemia and presence of anemia (mild, moderate or severe). Thus, anemia was confirmed when the hemoglobin level in the blood was lower than that of healthy people of the same age group and sex living in the same environment. With according to the World Health Organization hemoglobin levels in children 6-59 months categorized as follows: hemoglobin level < 11 g/dl (presence of anemia), including mild (10.0 -10.9 g/dl), moderate (7.0 - 9.9 g/dl) and severe (< 7 g/dl) anemia (1). The variables likely to explain the occurrence of anemia in children were: children's socio-demographic characteristics, characteristics related to the healthcare system, the environment and children's diet. Data collected using a pre-tested questionnaire programmed on tablet PCs were analyzed using SPSS version 25.0. Quantitative variables were expressed as means with standard deviations. The Pearson Chi-square test was used for bivariate analysis. A p-value < 0.05 was considered statistically significant. All variables with a p-value < 0.05 in bivariate analysis were entered into the binary logistic regression model to determine risk factors for the occurrence of anemia.

Ethical aspects: The agreement of the Ministry of Public Health, Population and Social Affairs was obtained beforehand.

The authorities in each locality were informed before the teams arrived in the survey localities. Participation in the survey was voluntary, and the data collected on respondents was kept confidential. The confidentiality of information and the anonymity of respondents were respected.

RESULTS

Prevalence of anemia in children aged 6-59 months: Of the 3969 children aged 6-59 months, 2264 had a hemoglobin level

of < 11 g/ dl, giving an estimated overall anemia prevalence of 57%. And among the 2264 anemic children, the prevalence of moderate anemia was estimated at 48.2% (Figure 1).

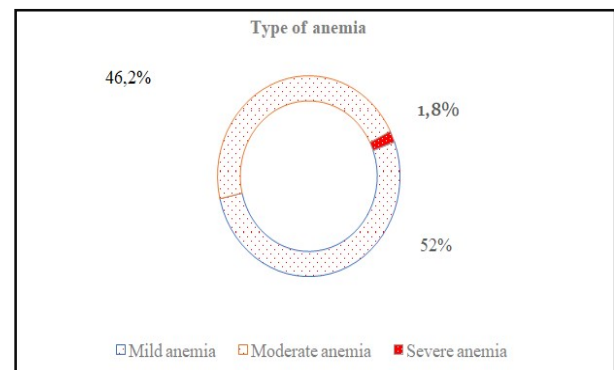


Figure 1. Distribution of children with anemia by type (n=2264)

Socio-demographic characteristics: Average age was 31.03 months \pm 14.94; 64.8% of children were in the 24-59 months age group. Males accounted for 50.3%, with a sex ratio of 1.01. Birth order was between 2 and 3 for 33.5% of children. As for marital status, 96.9% of the children's mothers were married, and 0.4% were single. The level of education was primary for 10.1% of mothers, and in 11.2% of cases the number of people per household was at least 11 (Table I).

Health-Care and Environmental Characteristics: In the 2 weeks following the survey, 17.2% of children had had at least one episode of diarrhea, and 32.8% had had a fever or hot body. Measles vaccination coverage was 80.2%, 76.5% had been supplemented with vitamin A and 73.4% had been dewormed. Among the children surveyed, 10.5% suffered from global acute malnutrition, and the rate of chronic malnutrition was 45.3% (Table II).

Dietary Characteristics: All children aged 6 to 23 months had been breastfed at least once, 96.4% had received colostrum, 47.1% had been put to the breast immediately, and 12.3% had received other milk in addition to breast milk. During the study, 87.7% of children aged 6 to 23 months were still being breastfed at the time of the study (Table III).

Factors Associated with anemia among children: In bivariate analysis, age ($p=0.001$), birth rank ($p=0.001$), mothers' level of education ($p=0.001$), occurrence of diarrhea ($p=0.023$), and occurrence of fever ($p=0.001$) in the 14 days preceding the survey were statistically associated with the occurrence of anemia among children. Chronic malnutrition ($p=0.012$), acute malnutrition ($p=0.001$) and underweight ($p=0.040$) were also associated with the occurrence of anemia in children. There was also a statistically significant association between breastfeeding ($p=0.001$) and anemia in children aged 6 to 23 months in this study (Table IV).

In multivariate analysis, the age range 6-23 months (OR: 2.38; 95% CI: 2.05 - 2.72), fever in the 14 days preceding the survey (OR: 1.43; 95% CI: 1.06 -1.92), stunting (OR: 1.52; 95% CI: 1.10-2.11) and weaning from breastfeeding before 23 months (OR: 2.19; 95% CI: 1.56-3.06) were risk factors for the occurrence of anemia in children. And with an OR: 0.68 <1, the absence of underweight (OR: 1/0.68; 95% CI: 1/0.99-1/0.46) was a protective factor for anemia in children (Table V).

Table I. socio-demographic characteristics of children aged 6 to 59 months

Variable	Category	n	%
Age of child n=3969	6 to 23 months	1399	35.2
	24 to 59 months	2570	64.8
Sex of child n=3969	Male	1996	50.3
	Female	1973	49.7
Birth order n=3969	First child	2519	63.5
	2-3	1331	33.5
	4-5	110	2.8
	≥6	9	0.2
Marital status n= 3926	Married	3802	96.9
	Widowed	58	1.5
	Divorced	49	1.2
	Single	14	0.4
Educational status of mother n=3923	No level	3189	81.3
	Primary school	398	10.1
	Secondary school	304	7.7
	Higher level	32	0.8
Household size n=3969	2-5	1791	45.1
	6-10	1734	43.7
	≥11	444	11.2

Table II. Health-care characteristics of children aged 6 to 59 months

Variable	Category	n	%
Had diarrhea in the past 2 weeks n=3920	Yes	675	17.2
	No	3245	82.8
Had fever in the past 2 weeks n=3912	Yes	1282	32.8
	No	2630	67.2
Vaccinated against measles n=3633	Yes	2912	80.2
	No	721	19.8
Received vitamin A n= 3888	Yes	2973	76.5
	No	915	23.5
Received dewormer n= 3398	Yes	2495	73.4
	No	973	26.6
Wasting n=3962	Yes	417	10.5
	No	3545	89.5
Stunting n=3965	Yes	1797	45.3
	No	2168	54.7
Underweight n=3963	Yes	1210	30.5
	No	2753	69.5

Table III. Dietary characteristics of children among 6 to 23 months

Variable	Category	n	%
Ever breastfed child n=1390	Yes	1390	100.0
	No	0	0.0
Child fed colostrum n=1384	Yes	1334	96.4
	No	50	3.6
Time for initiation of breastfed n=1381	Immediately	650	47.1
	Within 1 hour	274	19.8
	Within 24 hours	387	28.0
	>24hrs	70	5.1
Child received other milk n=1392	Yes	171	12.3
	No	1221	87.7
Still breastfeeding n=1385	Yes	1199	86.6
	No	186	13.4

DISCUSSION

The study enabled us to estimate the prevalence and identify the factors associated with anemia in children aged 6 to 23 months in Niger. Thus, the prevalence of global anemia was estimated at 57%, comparable to that reported by the Benin study (56.48%) (7), lower than the result found in the study by Ohene-Agyei et al in Togo (75%) (8) and higher than the result of Zuffo et al, (34.7%) in Brazil (9). The prevalence of anemia is relatively high in sub-Saharan Africa, given the above findings. Severe anemia accounts for 1.8%, well below the figure obtained by Adebo et al (30%) (7). Other authors found lower results: 0.9% in Brazil (9), 0.2% in Togo (8) and 0.4% in Ethiopia (10).

As for moderate anemia, in this study an estimated prevalence of 48.2% was observed, higher than those obtained by the Brazilian study (42.2%) (9), the Benin study (13.53%) (7) and the Ethiopian study (11.4%) (10). After logistic regression, children's age was identified as a risk factor for anemia (p-value = 0.001). The risk of anemia was 2.3 times higher in children under 2 years of age. The link between the occurrence of anemia and age (6-23 months) is also obtained by the study of Ohene-Agyei et al (8) and that of Habib et al in Pakistan in 2016(11). The prevalence of anemia decreases with age (12). Indeed, children under the age of 2 have higher nutritional requirements for their physical development than other children.

Table IV: Bivariate analysis of factors associated with anemia among children

Variable	Anemia	No anemia	P value
Sex			
Male	1143 (50.5%)	853 (50%)	0.72
female	1121 (49.5%)	852 (50%)	
Age of child			
6-23 months	971 (42.9%)	428 (25.1%)	0.001
24-59 months	1293 (57.1%)	1277 (74.9%)	
Birth order			
First child	1525 (67.4%)	994 (58.3%)	0.001
2-3	672 (29.7%)	659 (38.7%)	
4-5	61 (2.7%)	49 (2.9%)	
≥6	6 (0.3%)	3 (0.2%)	
Education of mother			
No level	1857(82.9%)	1332(79.2%)	0.001
Primary school	220 (9.8%)	178 (11.6%)	
Secondary school	157 (7.0%)	147 (8.7%)	
Higher level	7 (0.3%)	25 (1.5%)	
Diarrhea			
Yes	438 (19.6%)	237(14.1%)	0.023
No	1802 (80.4%)	1443(85.9%)	
Fever			
Yes	809 (36.2%)	473(28.2%)	0.001
No	1426(63.8%)	1204 (71.8%)	
Wasting			
Yes	270 (12%)	147 (8.6%)	0.001
No	1989 (88%)	1556 (91.4%)	
Stunting			
Yes	1113 (50.1%)	664 (39%)	0.012
No	1128 (49.9%)	1040 (61%)	
Underweight			
Yes	779 (34.4%)	431 (25.3%)	0.040
No	1480 (65.5%)	1273 (74.7%)	
Child fed colostrum			
Yes	931 (96.8%)	403 (95.5%)	0.240
No	31(3.2%)	19 (4.5%)	
Still breastfeeding			
Yes	857 (89.1%)	342 (80.9%)	0.001
No	105 (10.9%)	81 (19.1%)	

Table V: Multivariable logistic regression analysis of factors associated with anemia among children

Variable	AOR (95% CI)	P value
Age of child		
6-23 months	1	0.001
24-59 months	2.38 (2.05-2.72)	
Fever		
Yes	1	0.011
No	1.43 (1.06-1.92)	
Stunting		
Yes	1	0.012
No	1.52 (1.10-2.11)	
Underweight		
Yes	1	0.040
No	0.68 (0.46-0.99)	
Still breastfeeding		
Yes	2.19 (1.56-3.06)	0.001
No	1	
Acute malnutrition		
Yes	1	0.050
No	1.54 (0.99-2.39)	

Diouf et al have reported that the most critical period is between 6 and 2 years of age, when prenatal reserves are depleted and dietary diversification begins, without sufficient iron-rich foods (13). The Bangladesh study also showed that children under 24 months of age are 3 times more likely to develop anemia than children aged 2 to 5 (14). The presence of fever in the 2 weeks preceding the survey increased children's risk of anemia by 1.4 times. Moschovis et al in 2018 also reported a link between the presence of fever and anemia (15). Indeed, anemia can be caused by several factors including infections and inflammation, which could have fever as a symptom.

This could explain the link. Fever is a common symptom of acute and chronic illnesses that have been associated with anemia (16). Stunting increases the risk of anemia ((ORA: 1.52; CI (1.10-2.11)) in this study. Authors such as Khan et al in Bangladesh in 2016(14), Ayoyaet al in 2013 in Haiti(17) and Engidayeet al(18) in 2019 in Ethiopia have also reached the same result. Stunting is largely the result of inadequate nutrition and episodes of infection during the first 1,000 days of life (19). Low intake of iron-rich foods and diminished nutrient absorption caused by changes in the gastrointestinal epithelium in malnourished individuals contribute towards development of anemia (20).

The association of stunting and anemia in children could be due to the problems of household food insecurity and inadequate child health care in both health facilities and households (21). As for underweight, its absence protected against the occurrence of anemia by 1.4 times among the people surveyed in this study. Chronic diseases including underweight are generally causes of anemia, so its absence remains a protective factor. Several authors have also reported the link between underweight and anemia, Gebreegziabihier et al in 2014 and Engidaye et al in 2019 in Ethiopia (10, 18). In this study, acute malnutrition was not associated with anemia (p -value=0.05), a result consistent with those of the Bangladesh study (14) and Morocco (22), which also found no link between acute malnutrition and anemia in children. This link was reported in the Congo study (p =0.02) (23). Weaned children under 2 years of age were 2 times more likely to develop anemia than those still breastfed at the time of the study. The duration of breastfeeding may have an impact on the prevention of certain diseases such as anemia. However, breast milk contains little iron, and according to one study, one in five children fed exclusively by breastfeeding will subsequently suffer from iron deficiency (24).

CONCLUSION

Risk factors for the development of anemia in children aged 6 to 59 months in Niger were identified, and the prevalence of anemia in the same target group was estimated. Children at risk of developing anemia are aged between 6 and 23 months, who have had a fever in the 2 weeks preceding the survey, are stunted and/or underweight, and have been weaned before the age of 23 months. Health interventions should focus on these factors, notably nutrition education, management of malnourished children, and micronutrient supplementation, in order to reduce the prevalence of anemia in children, which is a public health problem in Niger.

Conflict of Interest: No conflict of interest in this study

REFERENCES

WHO. Hemoglobin concentrations for the diagnosis of anemia and assessment of severity. Vitamin and Mineral Nutrition Information System. 2011, Geneva. WHO/NMH/NHD/MNM/11.1 <http://www.who.int/vmnis/indicators/haemoglobin.pdf>. (Internet).

Sanogo D. D. Epidemiological aspects of malaria and anaemia in children aged 0 to 9 years in a malaria-endemic area: case of the irrigated area of Sélingué. 2012. (PhD thesis in Medicine). Bamako: University of Technical Sciences and Technologies of Bamako. Faculty of Medicine and Odontostomatology.

WHO & UNICEF. Focus on anemia: towards an integrated approach for effective anemia control. 2004. Available from: <https://www.who.int/publications/m/item/focusing-on-anemia-towards-an-integrated-approach-for-effective-anemia-control>.

WHO. Anemia in women and children. 2021. (Internet). Available from: <https://www.who.int/data/gho/data/themes/topics/topic-details/GHO/anemia-in-children-5-years>.

WHO. Regional Nutrition Strategy Technical Paper 2010-2019. No. EM/RC57/4. P.18. Available from: <https://iris.who.int/handle/10665/122869>

National Institute of Statistics: Final Report of the National Assessment of the Nutritional Situation using the SMART Methodology in Niger. December 2021. P.119.

Adebo A.A, Yessoufou AG, Behanzin JG, Kabanoude AA, Yessoufou AK. Anemia in children under 5 years of age seen at the pediatric department of the Abomey-Calavi/So-Ava Area Hospital (southern Benin). *J. Appl. Biosci.* 2018; 123: 73-78.

Ohene-Agyei P, Ndoadoumgue A, Baba-Toherou T, Yaya I, Nambiema A. Anemia in children aged 6-59 months in Togo: fractions attributable to individual, maternal and contextual characteristics. *Journal of Epidemiology and Public Health.* 2020; 68, Page S110.

Zuffo CR, Osorio MM, Taconeli CA, Schmidt ST, da Silva BH, Almeida CC. Prevalence and risk factors of anemia in children. *J pediatr (Rio J).* 2016; 92:353-60.

Gebreegziabihier G, Etana B, Niggusie D. Determinants of Anemia among Children Aged 6-59 Months Living in KilteAwulaelo Woreda, Northern Ethiopia. *Anemia.* 2014; Volume 2014:1-9. Doi: 10.1155/2014/245870

Habib MA, Black K, Soofi SB, Hussain I, Bhatti Z, Bhutta ZA et al. Prevalence and predictors of iron deficiency anemia in children under five years of age in Pakistan, a secondary analysis of national nutrition survey data 2011- 2012. *PLoS One.* 2016; 11(5): e0155051.

KengneTiné SC. Aggregating factors of anemia in households in Cameroon. *Montréal Univ Nutr Dep.* 2011; 192p.

Diouf S, Folquet M, Mbofung k, Ndiaye O, Brou k, Dupont C et al. Prevalence and determinants of anemia in young children in francophone Africa-involvement of iron deficiency. *Arch Pediatr.* 2015; 22 (11) :1188-97.

Khan JR, Awan N, Misu F. Determinants of anemia among 6-59 months aged children in Bangladesh: evidence from nationally representative data. *BMC Pediatrics.* 2016. 16:3 DOI 10.1186/s12887-015-0536-z

Moschovis PP, Wiens MO, Arlington L, Antsygina O, Hayden D, Dzik W et al. Individual, maternal and household risk factors for anemia in young children in sub-Saharan Africa: a cross-sectional study. *BMJ open.* 2018; 8(5): e019654.

Konstantyner T, Oliveira TCR, Aguiar Carrazedo Taddei JA. Risk factors for Anemia among Brazilian infants from the 2006 National Demographic Health Survey. *Anaemia.* 2012 ; 2012 :850681.

Ayoya MA, Ngnie-Teta I, Séraphin MN, Mamadoultaibou A, Boldon E, Saint-Fleur JE et al. Prevalence and risk factors for anemia in children aged 6 to 59 months in Haiti. 2013; *Anaemia*, Volume 2013, Article ID 502968.

Engidaye G, Melku M, Yalew A, Getaneh Z, Asrie F, Enawgaw B. Under nutrition, maternal anemia and household food insecurity are risk factors of anemia among preschool aged children in Menz Gera Midir district, Eastern Amhara, Ethiopia: a community based cross-sectional study. *BMC public health.* 2019 ; 19 (1), 1-11.

Lapillonne A, Kermorvant-Duchemin E. Extrauterine growth restriction of preterm infants. *Arch Pediatr.* 2008;15(5):540-2

Leal LP, Filho MB, de Lira PIC, Figueiroa JN, Osorio MM. Prevalence of anemia and associated factors in children aged 6-59 months in Pernambuco, Northeastern Brazil. *Revista de Saude Publica.* 2011, vol.45(3):457-466.

Jembere M, MPH1, Kabthymmer HR, Deribew A. Determinants of Anemia Among Children Aged 6 to 59 Months in Dilla

- Town, Southern Ethiopia: A Facility Based CaseControl Study. *Global Pediatric Health* Volume. 2020; 7:1-11. Available from: <https://doi.org/10.1177/2333794X20974232>
- El Hioui M, Aboussaleh Y, Ahami A.O.T, Farsi M. Contribution to the study of the prevalence of anaemia among preschool children in the region of Kenitra, Morocco. *Antropo*, 2009, 19 : 1-5. Available from : www.didac.ehu.es/antropo
- Soda MA, Kandala NB, Hamuli EK. Risk Factors for Anemia in Children in the DRC: An Ordinal Logistic Regression Approach to the DHS-DRC II Complex Data Sample Weight Model. *Biostatistics and Health Sciences*. 2021; Vol 2(2): 28-47.
- Doris Z. Frequent iron deficiency in breastfed children. (Internet). Available from: https://www.santeweb.ch/Santeweb-Sante_et_Medecine/. (cited 02/ 12/2023).
