The association between the severity of anemia and socio-demographic factors among children under five years of age in Kut City

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Abstract

Background. Anemia is a public health issue that affects both industrialized and developing nations. Childhood anemia has severe consequences, including reduced growth, poor motor and cognitive development, and increased death and morbidity.

Objective. This study aims to determine sociodemographic factors associated with the severity of anemia among under-five children in Kut City.

Methods. A cross-sectional study with a convenience sample (non-probability) was conducted among 264 children admitted to hospitals in Kut City, from September 1st, 2022, to March 1st, 2023. Data were collected *via* questionnaires, and descriptive and inferential statistics were used to evaluate the data.

Results. The total number of children participating in the study was 264, with 39.0% having mild anemia and 60.0% having moderate anemia, according to the World Health Organization classification of anemia. The results showed that the children most at risk of developing anemia were within 4 years of age and had a lower mean hemoglobin level than the rest of the age groups of the children participating in the study, compared to the mean+standard deviation (SD) (9.46+0.99). Boys are more affected than girls, and those who reside in rural areas have lower hemoglobin (HB) percentages with a mean+SD of (9.21+0.93). Unemployed mothers who read and write had the lowest HB percentage. In contrast, parents with primary education and government jobs have the lowest percentage of HB. Children of married mothers are more affected by anemia. Families with high overcrowding showed the lowest rate of HB. They experienced low socioeconomic status as a result. The degree of anemia was significantly correlated with the child's age, residence, mother's educational level, father's job, and socioeconomic position.

Conclusion. This study concludes a significant association between the severity of anemia and sociodemographic factors, both unmodifiable (age) and modifiable (residence, mothers' education, fathers' jobs, and economic and social status). Children with modifiable risk factors need to have their anemia risk constantly evaluated.

Introduction

Anemia, defined as a low blood hemoglobin concentration, has been observed to be a global problem that affects low-, middle-, and high-income nations and has adverse effects on social and economic development and severe health consequences. An estimated 1.3 billion people around the globe are affected by anemia, and around 9.6 million of the world's young children suffer a severe form of the disease.[1] Anemia is characterized by an increase in impoverished countries, anemia affects over fifty percent of preschool children, whereas, in developed countries, it affects at least thirty to forty percent of young children.[2] A decline in either the total number of red blood cells in the blood or the hemoglobin level, both of which are below their normal levels, leads to a decrease in the ability of the blood to carry oxygen.[3] Anemia is frequently seen in lower- and middle-income regions, with South East Asia and Africa, reporting the most significant incidence rates.[4] In

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Iraq, children under five years old had a prevalence of anemia of 29.4 percent in 2019.[5] A World Health Organization (WHO) survey found that the frequency of anemia is highest among children under the age of five.[6] Anemia is a condition that several different causes can cause; it can be nutritional, caused by deficiencies in iron, folate, and vitamin B12; clinical infectious illnesses, other factors that contribute to an increased risk include socioeconomic factors, such as poor household income, in addition to demographic characteristics, such as age, gender, and the size of the family. Anemia is distinguished by many unfavorable effects on health, all of which contribute to an elevated risk of morbidity and death.[7] Finding and treating the underlying cause of anemia in children under five is essential. Treatment for anemia brought on by dietary inadequacies frequently involves nutritional therapies, such as iron, vitamin B12, and folate supplements. Blood transfusions could be required in some situations, mainly when the anemia is severe or brought on by genetic diseases. It's crucial to manage anemia in young children by treating underlying infections and, if necessary, giving chronic disorders the proper medical attention.[8]

Dietary deficiencies, infections, and genetic diseases are a few reasons for anemia in children under five. Early detection and adequate therapy of anemia are essential to avoid long-term effects on a child's growth and development. Anemia in young children can be lessened with careful nutritional monitoring, access to quality healthcare, and preventative interventions such as good prenatal care for expectant mothers.[9] The study aims to identify sociodemographic factors relevant to the severity of anemia in children under the age of five in Kut City.

Materials and Methods

Study duration
The study was conducted from September 1st, 2022, to March 1st, 2023.

Study design
This study was a descriptive cross-sectional study design.

Population source
The source of this study was all children under the age of five who were admitted to selected hospitals in Kut City during the study period.

Study setting
The research was carried out at three hospitals in kut city. The AL-Zahra Teaching Hospital, AL-Karama Teaching Hospital, AL-Kut Gynecology Obstetric, and Pediatrics Hospital are located in Kut City, the center of Wasit Governorate, about 180 kilometers south of Baghdad, Iraq's capital.

Study sample
This study included 264 samples from children. Using a convenience sample selected throughout the using a non-probability sampling approach.

Inclusion criteria
Children with a hemoglobin level of less than (11 gm/dl) in the age group from 6 months to 5 years.

Exclusion criteria
This study excluded children under 6 months, over 5 years old, and with severe anemia due to the small number of cases (only two cases) and children diagnosed with hereditary blood diseases such as thalassemia, sickle cell anemia, glucose-6-phosphate dehydrogenase deficiency.

Sample size
The sample size was calculated according to the objectives. To determine the proportion of mild and moderate anemia among children under five years in Kut City. The sample size was calculated using a single proportion formula based on the study done by Ibrahim *et al.*, 2020.[2] The biggest sample size was 249 (Table 1).

$n = (Z\alpha/\Delta)2 \times [p (1-p)]^{10}$
n = the required sample size
Zα value based on 95% confidence interval = 1.96
Δ = precision = 0.05
P = Prevalence of Mild anemia: 18.21%
P = Prevalence of moderate anemia: 3.35%

Ethical considerations
The current study approvals were officially obtained from the Department of Community Health Technologies and the Deanship of Graduate Studies and Scientific Research at Southern Technical University. Also, consent was obtained from the Iraqi Ministry of Health/Wasit Health Department/Office of the Director-General/Center for Training and Human Development/Unit of Knowledge Management/Research according to letter y number 458 dated 17/10/2022. Parents or parents of children have been informed of the goals, objectives, and methodology of the study before sample collection. The researcher announced and is committed to the participants regarding the confidentiality of the survey. The study is optional and unspoken. Non-personal data has been presented or discussed. All ethical considerations, including respect for issues, legality, and confidentiality, were preserved.

Study stages
The study included children for anemia. The current analysis tools included the main components, such as filling out a study form, laboratory tests, and measuring height and weight.

Socio economic status
The World Health Organization (WHO - Scale) categorized social and economic status differently. Occupation, educational attainment, overcrowding index, and ownership are the four categories on this scale that are used to evaluate social and financial standing (Table 2). The highest score for each was (25) while the lowest was (9). The lowest score was (0), with the educational level being the exception. The Tiwari scale, which has three levels: high, medium, and poor, was also used to categorize people's social and economic standing. The crowding index, except for the bathroom and kitchen, was also determined by dividing the number of family members by the total number of rooms.[11,12]

Classification of anemia
According to the WHO classification, which considered

Table 1. Sample size determination for mild and moderate anemia.

For mild anemia	For moderate anemia
n = (1.96/0.05)²×0.18(1-0.18)	n = (1.96/0.05)²×0.03(1-0.03)
n = 1536.64×0.1476=226	n= 1536.64×0.0291=49
Estimated sample size calculated =n+10% drop rate =249	Estimated sample size calculated =n+10% drop rate =54

patients with a hemoglobin level of 10.0 to 10.9 g/L per liter to be patients with mild anemia, patients with moderate anemia have hemoglobin levels between 7.0 to 9.9 g/L, those with severe anemia have less than 7g/L, and healthy individuals have hemoglobin levels over 11.0 g/L. One hundred three of our patients have mild cases, while the rest, 161, have moderate cases. Another classification is divided into cell sizes based on Hb levels and MCV.[13]

Data collection method

Data was collected using a questionnaire and from the child's medical record. A questionnaire was developed through a comprehensive review of relevant literature and used as a data collection tool by the mother of the sick child interviewed. Each interview lasted about 15-20 minutes.

Questionnaire

Data were collected by conducting a direct interview with the parents of children through a questionnaire. The questionnaire included closed questions. Consisting of questions related to the social and demographic characteristics of the child and the child's family, such as residence, age of the mother and father, marital status, parents 'careers, mother's and father's educational level, family type, place of residence, the introduction of supplementary foods, number of family members, and number of bedrooms Except for the kitchen.

Statistical analysis

Data analysis was done using the available statistical package, SPSS-27 (Statistical Packages for Social Sciences, version 27). Data were presented in simple measures of frequency, percentage, mean, standard deviation, and range (minimum-maximum values) using graphs such as pies and gauges.

The Crosstabs procedure forms two-way and multiway tables and provides a variety of tests and measures of association for two-way tables. The table's structure and whether categories are ordered determine what test or measure to use.

The One-Way ANOVA procedure produces a one-way analysis of variance for a quantitative dependent variable by a single factor (independent) variable. Analysis of variance is used to test the hypothesis that several means are equal. This technique is an extension of the two-sample t-test. In addition to determining that differences exist among the means, you may want to know which means differ. Statistical significance was considered whenever the P value was equal to or less than 0.05.

Results and Discussion

Socio-demographic characteristics

As shown in Table 3, the total sample size was 264 children of both sexes selected, of whom 136 (51.5%) were girls. The mean and standard deviation of the age of the studied sample (26.28±11.66) years. Children under three years old are the most between age group (40.9%), all of whom were urban residents (51.9%); Around (37.5%) of mothers educated have read and written, while the fathers (28.4%) have primary education. Unemployed mothers and fathers appeared to participate most in
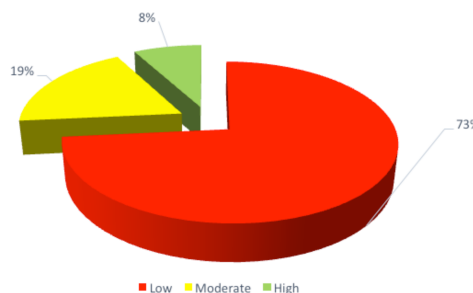

Figure 1. Distribution of the participants according to socioeconomic status.

Table 2. Evaluation of the social and financial standing.

Item Gender	Score Male	Female	Description
Occupation of Father (Double)	25	25	High professional & managerial jobs as doctors, engineers, professors, large employers, directors of business, land owners
	17	17	Lower professionals, skilled and semiskilled workers as school, teacher, clerical workers, owners of small business, military men, policemen.
	9	9	Unskilled workers as laborers, farmers casual workers, unemployed and retired.
Level of Edu. (Double)	0	0	Illiterate
	5	5	Read & write
	10	10	Primary graduate
	15	15	intermediate graduate
	20	20	Secondary graduate
	25	25	College graduate
Crowding index (Single)		25	-2 (up to)
		17	- 4 (up to)
		9	≥ 5
Property (Single)		25	House is rented, with or without a car and most of the household assets
		9	House is shared, with other family, no car and some of the household assets

Crowding index = (No. of family members /No. of rooms); Except bath & kitchen rooms
For double
High: 121–150;   Mod.: 90 - 120;   Low: 89 - & less. (Tiwari, 2005)
For single
High: 81–100;   Mod.: 60 - 80;   Low: 59- & less. (Al-Naqeeb, 2009)

the study (89.4% and 63.9%, respectively). The marital statistics of the mothers showed a high percentage of them being married (82.2%). (56.1%) had a crowding high index.

Distribution of the participants according to socioeconomic status

Figure 1 shows the participants' distribution according to the individual's socioeconomic status. The highest participation was among those with low incomes (73%) and moderate incomes (19%), and the lowest participation was among those with high incomes (8%).

The relationship between anemia severity in children under five years of age with the sociodemographic variables

Table 4 showed the results indicate that most of the children at the age of four years had a lower mean hemoglobin level than the rest of the age groups of the children participating in the study than the mean and standard deviation (9.46+0.99); as for the children who had the highest percentage of hemoglobin, they were from (6-11) months, and the mean and standard deviation for them were (9.98±0.77). In addition, this indicates an association between the level of hemoglobin and the age groups participating in the study (P=0.029). Therefore, in this study, anemia was more common among the 36-47 months age group. The result of this study agrees

with Dutta *et al*., 2020 showed a larger proportion of kids in the 36-month-old and older age group were more impacted because, with age, the child needs a lot of nutrients for growth, development, and increased vital activity and movement.[14]

Regarding sex, the results showed that most male children had a lower percentage of hemoglobin than the children participating in the study. The mean and standard deviation were (9.40+0.93). There was no statistically significant relationship (P>0.05). That is, males are more affected than females; the increased occurrence among boys is due to their development, which requires more Iron than the diet can provide. This study agrees with the survey conducted by Chowdhury *et al*., 2020, in which it was mentioned that males had more anemia than females.[15]

As for residence, the results showed that those who live in rural areas have lower hemoglobin percentages with a mean and standard deviation (9.21+0.93) than those who live in urban areas. Therefore, there is a statistical relationship between residence and high hemoglobin levels P=0.000; Anemia was more common in rural areas. The survey result agreed with Gebreweld *et al*., 2019. His thesis found that children with anemia in rural areas had a high rate of (73.0%), because of poor interest in health services, including health education.[16]

As for the mother's educational level, this study indicates that mothers with an academic level of reading and writing have the lowest mean hemoglobin percentage and a standard deviation of them (9.25+0.96) from the rest of the other educational groups.

Table 3. Distribution of the participants according to sociodemographic variables.

SDGVs	Categories	F.	%
Age group by months	6-11	28	10.6
	12-23	87	33.0
	24-35	91	34.5
	36-47	45	17.0
	48-59	13	4.9
	Mean± Std. Deviation	26.28±11.66	
Gender	Boy	128	48.5
	Girl	136	51.5
Residence	Rural	127	48.1
	Urban	137	51.9
Mother education	Illiterate	32	12.1
	Read and writes	99	37.5
	Primary	10	26.1
	Secondary	49	18.6
	College education	15	5.7
Mother employment	Unemployed	236	89.4
	Self-employed	15	5.7
	Governmental employed	13	4.9
Mothers' marital status	Married	217	82.2
	Divorced	32	12.1
	Widower	15	5.7
Father education	Illiterate	21	8.0
	Read and writes	51	19.3
	Primary	75	28.4
	Secondary	73	27.7
	College education	44	16.7
Father employment	Unemployed	95	36.0
	Self-employed	47	17.8
	Governmental employed	122	46.2
Crowding index	>4.1	24	9.1
	2.1-4	148	56.1
	0-2	92	34.8
Total		264	100.0

SDGVs, sociodemographic variables.

Therefore, there is a statistical relationship between the percentage of hemoglobin and the academic level of the mother (P=0.006). In this study, anemia was more common in children whose mothers could read and write. This finding agreed with Abdulhameed et al., 2016.[17]

As for the mother's profession, the study showed that most unemployed mothers work as housewives. They have a lower percentage of mean hemoglobin and their standard deviation (9.45+0.95) than other professions, so there is no statistical relationship (P>0.05). The results showed that anemia was more common in children whose mothers were unemployed (homemakers); Okoroiwu, 2021 supported this study. It showed that the degree of anemia varies in children varied depending on the mother's job level and the parents' educational background.[18]

The study of the marital status of the mothers showed that the married mothers have the lowest percentage of the mean hemoglobin and the standard deviation for them (9.44+0.955), so there was no statistical relationship (P>0.05). The study indicates that anemia is more common in children whose mothers are married. This finding was consistent with a survey conducted by Parbey et al.[19]

As for the cultural level of the father, the study showed that the father who has primary education has the lowest percentage of hemoglobin in the mean and the standard deviation for them (9.26+1.10), and there was no statistical relationship (P>0.05). The study found anemia most common in children whose fathers had only primary education. This study disagrees with the analysis obtained by Xin et al., which showed that the higher the education level of children's fathers, the lower the level of childhood anemia.[20]

As for fathers' jobs, the study indicates that fathers with government jobs have the lowest percentage of hemoglobin mean and standard deviation (9.36±0.95). However, a statistically significant correlation was found (P=0.002). The results indicate that anemia was more common among children whose fathers were government employees. This study agrees with the investigator's point of view.[21]

As for the overcrowding index, overcrowding has resulted in many health problems, one of which is the nutritional status of children, appears in our study the overcrowding index that families with high crowding have the lowest percentage of the mean hemoglobin and the standard deviation (9.22±0.98). However, there is no statistically significant relationship (P>0.05) where anemia was more common in children whose families suffer from crowding. The result of this study is consistent with Abou-Rizk et al. This study showed that there was a middle overcrowding index.[22]

A study of families' socioeconomic status showed that children with a low socioeconomic status have the lowest percentage of the mean hemoglobin and the standard deviation (9.39+0.96). However, there was a statistically significant relationship (P=0.024), where anemia was more common in children whose

Table 4. Factor associated with severity of anemia in children under five years based on sociodemographic variables.

SDGVs	Categories	Severity of anemia		Hemoglobin level Mean+SD	P value
		Moderate, n(%) 161(61.0)	Mild, n(%) 103(39.0)		
Age group by months	6-11	11(39.3)	17(60.7)	9.98+0.77	0.029
	12-23	53(60.9)	34(39.1)	9.46+0.99	
	24-35	57(62.6)	34(37.4)	9.47+0.96	
	36-47	32(71.1)	13(28.9)	9.23+0.94	
	48-59	8(61.5)	5(38.5)	9.54+0.79	
Gender	Boy	82(64.1)	46(35.9)	9.40+0.93	0.166
	Girl	79(58.1)	57(41.9)	9.56+0.97	
Residence	Rural	94(74.0)	33(26.0)	9.21+0.93	0.000
	Urban	67(48.9)	70(51.1)	9.74+0.91	
Mother education	Illiterate	18(56.3)	14(43.8)	9.61+0.88	0.006
	Read and writes	69(69.7)	30(30.2)	9.25+0.96	
	Primary	47(68.1)	22(31.9)	9.46+0.83	
	Secondary	21(42.9)	28(57.1)	9.79+1.03	
	College education	6(40.0)	9(60.0)	9.89+0.98	
Mother employment	Unemployed	147(62.3)	89(37.7)	9.45+0.95	0.249
	Self-employed	6(40.0)	9(60.0)	9.87+0.97	
	Governmental employed	8(61.5)	5(38.5)	9.59+1.05	
Mothers marital status	Married	137(63.1)	80(36.9)	9.44+0.955	0.69
	Divorced	18(56.3)	14(43.8)	96.3+0.99	
	Widower	6(40.0)	9(60.0)	9.86+0.85	
Father education	Illiterate	14(66.7)	7(33.3)	9.35+0.96	0.14
	Read and writes	35(68.6)	16(31.4)	9.43+0.84	
	Primary	46(61.3)	29(38.7)	9.26+1.10	
	Secondary	47(64.4)	26(35.6)	9.56+0.87	
	College education	19(43.2)	25(56.8)	9.87+0.82	
Father employment	Unemployed	60(63.2)	35(36.8)	9.43+0.99	0.002
	Self-employed	19(40.4)	28(59.6)	9.92+0.80	
	Governmental employed	82(67.2)	40(32.8)	9.36+0.95	
Crowding index	>4.1	17(70.8)	7(29.2)	9.22+0.98	0.189
	2.1-4	91(61.5)	57(38.5)	9.45+0.94	
	0-2	53(57.6)	39(42.4)	9.60+0.95	
SES	Low	125(64.4)	69(35.6)	9.39+0.96	0.024
	Moderate	26(53.1)	23(46.9)	9.76+0.84	
	High	10(47.6)	11(52.4)	9.73+1.03	

SDGVs, sociodemographic variables; SES, socioeconomic status.

families suffer from low socioeconomic status. The result of this study was in agreement with Abdulhussein & Ahmed; low socioeconomic levels can increase the risk of food instability, malnutrition, and vulnerability to infectious diseases, all leading to childhood anemia.[23]

Conclusions

Anemia among children aged six to fifty-nine months anemia was found to be a severe public health problem. Regarding risk factors, the Children's age, residence, mothers' education, fathers' jobs, and economic and social status were the most critical risk factors determinants of the severity of anemia. The age range of thirty-six to forty-seven months has the highest chance of developing Hb anemia, and living in a rural area is one of the most significant risk factors. Therefore, the study suggested an urgent need to determine the nutritional status of children with age, especially the preschool stage, Early detection and increased awareness and education about anemia risk factors in children under five years old and especially among parents who finished primary graduate, as well as those who socioeconomic status is low, Provision of appropriate medicines and the need to review primary health care centers.

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