Prevalence of Anemia among Children Aged 6 Months - 12 Years Attending the Emergency Room in Princess Rahma Teaching Hospital for Children in Northern Jordan

Khaled Yaseen Shalby*

Abstract

Objective: The purpose of this work was to analyze the prevalence of anemia among children aged 6 months- 12 years attending emergency room of a hospital in Northern Jordan.

Method: This was a cross-sectional retrospective study performed from May to August 2014 using the computerized database of Princess Rahma teaching hospital for children. This study analyzed information from 1,728 children aged 6 months to 12 years attending the emergency room. Children with abnormal white blood counts at the time of the hemoglobin test and with chronic diseases were excluded. The data of age, gender, hemoglobin level, and severity of anemia were analyzed. Anemia was defined as hemoglobin level < 11 g/dL in children aged 6-59 months and <11.5 g/dL in children aged 5-12 years, according to cut-off levels of hemoglobin suggested by the World Health Organization.

Results: The overall prevalence of anemia in children aged 6 months-12 years was 24.9% (N= 431). The overall prevalence of anemia in children aged 6 months to 5 years was 32% (N=351) and children below 2 years presented the highest risk of anemia (39%, N=241). Most anemic cases in children from 6 months to 5 years (67.5%, 237/351) were mild, followed by 31.3% (110) and 1.1% (4) of the cases that showed moderate and severe anemia, respectively. Mean hemoglobin value for children from 6 months to 5 years was 11.4 g/dl. The overall prevalence of anemia in children aged 5-12 years was12.7 % (N=80). On the other hand, most anemic cases in children aged 5-12 years (57.5%) showed moderate anemia, while 40% of the cases presented mild type and 2.5% severe anemia. Mean hemoglobin value for children from 5years to 12 years was 12.8 g/dl.

Conclusion: Given the high prevalence of childhood anemia observed in northern Jordan, particularly among those less than 5 years of age, and given the negative consequences of anemia on their cognitive and behavioral development even in later years, there is an urgent need for effective and efficient public health intervention. In April 2002, Jordan began a wheat flour fortification program that included iron and folic acid, but despite this national fortification program there was no statistically significant change in the prevalence of anemia, indicating that other causes (in addition to iron deficiency) are responsible for anemia. In addition, the high prevalence of anemia supports the need to develop strategies in prevention rather than treatment in this important public health issue.

Keywords: Anemia, Jordan, childhood anemia, hemoglobin.

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Introduction

Anemia is a condition in which the number of red blood cells or their oxygen-carrying capacity is insufficient to meet physiologic needs. The body's physiologic needs vary by age, sex, altitude, smoking, and pregnancy status. Iron deficiency is thought to be the most common global cause of anemia. Although

*Ministry of health of Jordan, Princess Rahma teaching hospital for children

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other conditions, such as deficiency of folate, vitamin B12 and vitamin A, chronic inflammation, parasitic infections, and inherited disorders can also cause anemia. Moreover, pregnant women and children are particularly vulnerable.[1]

In 1985, the World Health Organization (WHO) estimated that about 30% of the world population was anemic.[2] A WHO analysis performed in 2008 reported that anemia affected 24.8% of the world's population, including 42% of pregnant women, 30% of non-pregnant women, and 47% of preschool children.[3] Recently, global anemia prevalence was estimated at 29% in pregnant women, 38% in non-pregnant women, and 43% in children, with reductions since 1995 in each group.[4]

Childhood anemia is a major public health problem worldwide. It is associated with serious consequences including growth retardation, impaired motor and cognitive development, and increased morbidity and mortality.[5]

Four national surveys document the prevalence of anemia in preschool children:

1. The National baseline survey on iron deficiency anemia and vitamin A deficiency conducted in 2002 (MoH, 2002) [6]
2. Jordan population and family health survey (JPFHS) 2002 (Do's and ORC Macro, 2003)[7]
3. JPFHS 2009 (DoS and ICF Macro, 2010) [8]
4. Micronutrient Survey 2010 (MoH, 2011) [9]

The 2002 and2010 surveys included children aged 12-59 months while the JPFHS 2002 and 2009 include children aged 6-59 months. Due to differences in age-groups, trends are difficult to estimate accurately. When comparing data from the 2010 micronutrient survey with those of the 2002 baseline survey (children aged 12-59 months), the prevalence of anemia decreased slightly from 20% in 2002 to 17% in 2010. However, when comparing these set of data with JPFHS 2002 and 2009, there is a large difference in prevalence, even when considering the difference in age-group. According to JPFHS 2002 and 2009, the prevalence of anemia among children aged 6-59 months was about 33-34% and remained stable between these two surveys. Methodological issues may explain these inconsistencies.[10]

This study was carried out to determine the prevalence of anemia in children in Northern Jordan and to compare the results with the data of the Jordan population and family survey 2012 and with the data of surrounding countries.

OBJECTIVES & METHODS:

The purpose of this work was to analyze the prevalence of anemia among children aged 6months - 12 years attending emergency room of the hospital. By using the computerized database of Princess Rahma teaching hospital for children, a cross-sectional retrospective study was carried out from May to August 2014, during which 1,728 children aged 6 months to 12 years attended the emergency room. Children with abnormal WBC and with chronic diseases were excluded.

Data analyzed for age, gender, hemoglobin level using SPSS statics version 19. Anemia was classified as mild, moderate, or severe based on the definition of anemia provided by WHO (Table 1). Anemia is defined as hemoglobin levels < 11 g/dL in children aged 6-59 months and < 11.5 g/ dL in children aged 5-12 years, according to cut-off levels of hemoglobin suggested by WHO.[7] The blood samples were collected in EDTA tubes and the analysis was performed with an automated cell counter.

Table 1. Hemoglobin concentrations for the diagnosis of anemia and assessment of severity.[1]

Haemoglobin levels to diagnose anaemia at sea level (g/l)[2]

Population	Non-Anaemia*	Anaemia*		
		Mild[3]	Moderate	Severe
Children 6 - 59 months of age	110 or higher	100-109	70-99	lower than 70
Children 5 - 11 years of age	115 or higher	110-114	80-109	lower than 80
Children 12 - 14 years of age	120 or higher	110-119	80-109	lower than 80

RESULTS:

Overall prevalence of anemia in children aged 6 months-12 years 24.9% (N=431). The overall prevalence of anemia in children aged 6 months to 5 years was 32% (N=351) (Figure 1/Table 2); and children below 2 years presented the highest risk of anemia (39%, N=241). Most of the anemic cases in children from 6 months to 5 years (67.5%, 237/351)

were mild type, 31.3% (110) cases were moderate and 1.1% (4) presented severe anemia (Table 2). The mean hemoglobin value for children from 6 months to 5 years was 11.4 g/dl.

Figure 1. Bar (a) and pie chart (b) about anemia condition among children aged 6 months to 5 years.

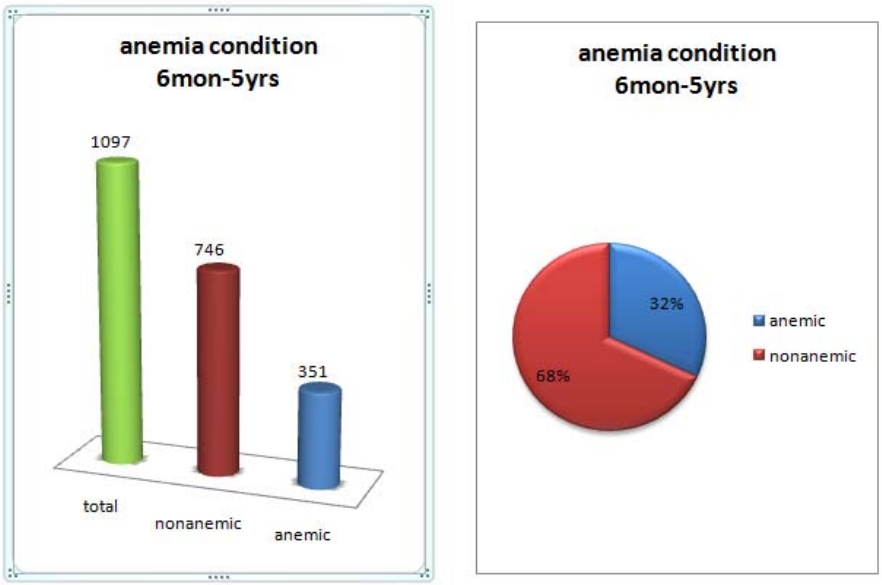

Table 2. Patients gender distribution and anemia type and condition among children aged 6 months to 5 years.

	Gender		Total	
	Male	**Female**		
N	**662**	**435**	**1,097**	
%	**60.30%**	**39.70%**	**100.00%**	
	Anemia condition		**Total**	
	Anemic < 5 years	**Non-Anaemic < 5 years**		
N	**662**	**435**	**1,097**	
%	**60.3%**	**39.7%**	**100.0%**	
	Anemia severity			
	Mild	**Moderate**	**Severe**	**Total**
N	**237**	**110**	**4**	**351**
%	**67.50%**	**31.30%**	**1.1%**	**100.00%**

The overall prevalence of anemia in children aged 5 -12 years was 12.7 % (N=80) (Figure2, Table 3). Most of the anemic cases in children aged 5-12years (57.5%) were moderate, while 40% of the cases presented
mild type, and 2.5% showed severe anemia (Table 3). Mean hemoglobin value for children from 5years to 12 years was 12.8 g/dl

Figure 2. Bar (a) and pie chart (b) about anemia condition among children aged 5-12 years.

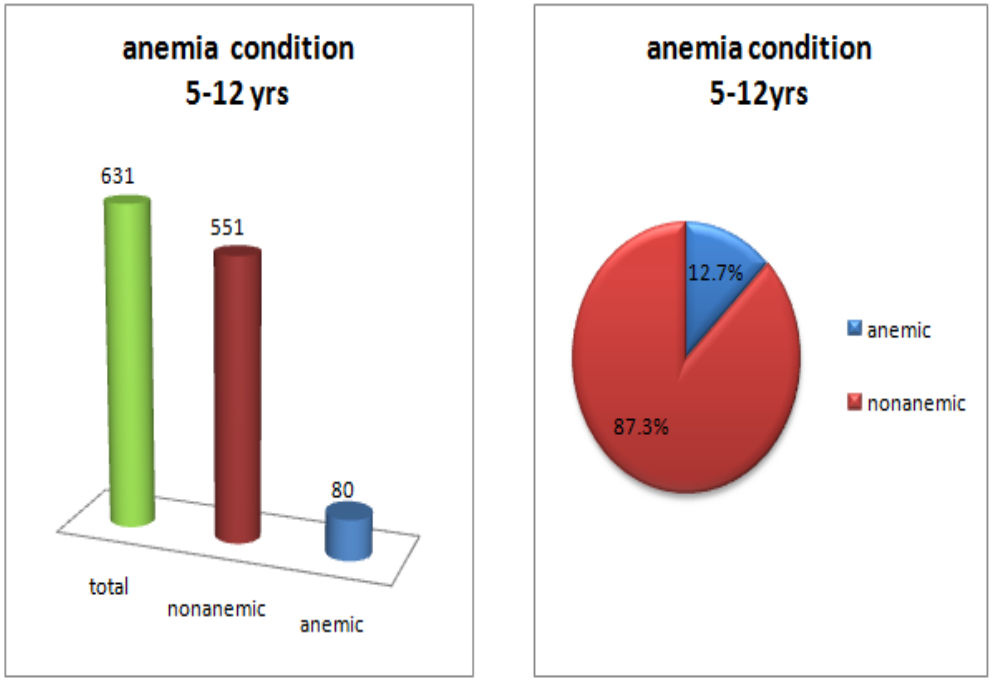

Table 3. Patients gender distribution, anemia type and condition among children aged 5 – 12 years.

	Gender		Total
	Male	**Female**	
N	**374**	**257**	**631**
%	**59.30%**	**40.70%**	**100.00%**
	Anemia condition		**Total**
	Anemic > 5 years	**Non-anemic**	
N	**80**	**551**	**631**
%	**12.7%**	**87.3%**	**100.0%**

	Anemia severity			
	Mild	**Moderate**	**Severe**	**Total**
N	**32**	**46**	**2**	**80**
%	**40.00%**	**57.50%**	**2.5%**	**100.00%**

DISCUSSION:

Childhood anemia is a major public health problem worldwide. It is associated with serious consequences including growth retardation, impaired motor and cognitive development, and increased morbidity and mortality. [11] Anemia is common among children in Jordan; one-third (32%) of children from 6-59 months are anemic. It has been reported that 20% of children present mild anemia while 12 % present moderate anemia.

Less than 1% of children were diagnosed with severe anemia. Among infants, the prevalence of anemia is highest at age 6-8 months (61%), decreases at age 9-11 months (41%), and increases again at age 12-17 months (54%), after which it linearly declines to a low 17% in the age group 48-59 months (Table 4). Differences in anemia levels are small between boys and girls, in rural and urban areas, and by region.12

Table 4. Jordan population family health survey (JPFHS), 2012. [12]

Percentage of children age 6-59 months classified as having anemia, by background characteristics, Jordan 2012

Background characteristic	Anemia status by hemoglobin level: Any anemia (<11.0 g/dl)	Mild anemia (10.0-10.9 g/dl)	Moderate anemia (7.0-9.9 g/dl)	Severe anemia (< 7.0 g/dl)	Number of children
Age in months					
6-8	61.3	34.8	26.1	0.5	207
9-11	41.2	24.6	16.7	0.0	263
12-17	54.0	29.7	23.9	0.4	579
18-23	42.8	24.2	18.3	0.3	555
24-35	31.9	20.4	11.4	0.2	1,119
36-47	25.8	16.2	9.4	0.3	1,199
48-59	17.1	12.2	4.8	0.2	1,196
Sex					
Male	33.7	19.6	13.8	0.3	2,635
Female	31.0	19.9	11.0	0.1	2,484
Mother's interview status					
Interviewed	32.2	19.8	12.1	0.2	5,019
Not interviewed but in household	(34.9)	(4.6)	(30.3)	(0.0)	55
Not interviewed and not in the household[1]	45.9	26.2	19.7	0.0	46
Residence					
Urban	32.2	19.5	12.5	0.2	4,142
Rural	33.0	20.7	12.1	0.2	977
Region					
Central	32.4	20.0	12.2	0.2	3,014
North	32.5	19.7	12.6	0.2	1,603
South	31.8	18.4	13.0	0.4	503
Governorate					
Amman	34.2	22.2	12.0	0.0	1,738
Balqa	37.5	20.4	16.0	1.1	341
Zarqa	27.4	15.4	11.7	0.3	797
Madaba	24.6	16.9	7.5	0.2	138
Irbid	34.2	21.0	13.0	0.2	960
Mafraq	26.3	16.2	10.0	0.1	325
Jarash	31.3	17.7	13.2	0.4	187
Ajloun	37.2	21.4	15.6	0.2	131
Karak	34.7	19.0	15.1	0.6	224
Tafiela	21.9	15.9	5.7	0.3	87
Ma'an	38.1	19.8	18.0	0.3	88
Aqaba	28.6	17.8	10.5	0.2	104
Badia					
Badia	39.3	23.5	15.8	0.0	420
Non Badia	31.7	19.4	12.1	0.2	4,700
Camps					
Camp	36.5	21.1	15.3	0.0	222
Non camp	32.2	19.7	12.3	0.2	4,897

The overall prevalence of anemia in Jordan has not changed much in the last decade, decreasing very slightly from 34 %in 2002 to 32 %in 2012.[12] Our data were consistent with data of Jordan population family the survey carried out in 2012.[12]

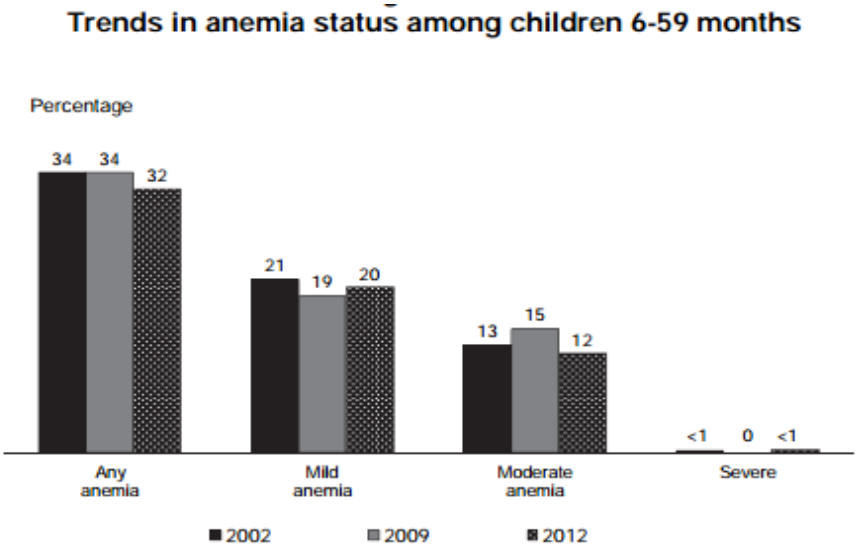

Figure 3. Trends in anemia status among children 6-59 months. [12]

Previous reports indicated that anemia is the most prevalent nutritional disorder in children from the Middle East and North Africa.[13] The prevalence of anemia ranges from approximately 11% to 40% as it was shown to be 11.6% in Saudi school-aged children[14], and 39.6% in Egyptian preschool children.[15] According to the classification established by WHO, the prevalence of anemia among anemia types is5%–19.9%, 20%–39.9%, and ≥40% for mild, moderate, and severe anemia, respectively. Most Arab Middle East countries fall within the category of moderate to severe deficiency.[16]

In a cross-sectional study performed with500 Saudi infants aged 6–24 months attending a well-baby clinic, Al Hawsawi et al. reported that 49% presented iron deficiency anemia (IDA), defined as Hb < 11 g/dL and serum ferritin <10 µg/L.[17] In addition, Abou-Zeid et al. reported that 11.6% of Saudi school children were anemic, with a declining rate of anemia from ages 6 to 14 years.[14] It is worth noting that many children in this study were underweight (14.2%), stunted (12.2%), obese (9.8%), or suffered from wasting (13.8%), which could be influencing the results of the study.

In another cross-sectional study of 300 Egyptian infants aged 6–24 months old, Elalfy et al. reported that 66% presented anemia (Hb < 11 g/dL), of which 43% was caused by IDA.[14] Austin et al. examined the trends in anemia (Hb < 11 g/dL) from the Egyptian Demographic and Health Survey (EDHS) conducted between 2000 and 2005, and revealed a prevalence of 37%–52% among Egyptian children aged 12–36 months.[13] We believe that in order to initiate anemia prevention and control, a strategy or long-term plan should be developed. This strategy should include surveying the anemia problem, assessing anemia related problems, and suggesting improvements of the current programs or even introducing new programs.[19] The majority of available data on nutritional status in the Middle East region have been generated from small-scale observational

studies, but there are no previous studies performed on larger populations. Randomized clinical trials (RCTs) to study primary and secondary prevention of malnutrition have been conducted outside of the Middle East and only local and regional studies are needed to implement culturally appropriate approaches within this region.

Conclusions:

Given the high prevalence of childhood anemia observed in northern Jordan, particularly among children below 5 years old, and given the negative consequences of anemia on their cognitive and behavioral development even in later years, there is an urgent need for an effective and efficient public health intervention. In April 2002, Jordan implemented wheat flour fortification program that included four supplementations with iron and folic acid. Despite this, there was no significant change in the prevalence of anemia, indicating that other causes, in addition to iron deficiency, are responsible for anemia in preschool children. It is therefore necessary to further explore other causes of anemia to implement an array of appropriate interventions, such as food-based approaches, control of parasitic infections, among others.

Limitations of the study:

In this study a large sample size was evaluated, however they were all recruited from a single centre suggesting that more hospital children should be included in the study to obtain more representative results of the region. Nevertheless, the hospital received children from different areas, including urban and rural areas. Children with abnormal WBC and chronic diseases were excluded, suggesting that other causes of anemia might have been neglected in this study. In further studies, including this type of patients might help resolve why flour fortification was not suitable for reducing children anemia prevalence.

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انتشار فقر الدم بين الأطفال الذين تتراوح أعمارهم بين 6 أشهر و12 عامًا المراجعين لوحدة الطوارئ في مستشفى الأميرة رحمة التعليمي للأطفال، شمال الأردن

خالد الشلبي*

*طبيب أمراض الدم والأورام لدى الأطفال، مستشفى الأميرة رحمة التعليمي للأطفال، وزارة الصحة الأردنية.

الملخص

الأهداف: استخدام قاعدة البيانات المحوسبة لمستشفى الأميرة رحمة التعليمي للأطفال لتحليل انتشار فقر الدم بين الأطفال الذين تتراوح أعمارهم بين 6 أشهر و12 سنة الذين يترددون على غرفة الطوارئ بالمستشفى.

الطريقة: كانت هذه دراسة مستعرضة بأثر رجعي من أيار إلى أب 2014 باستخدام قاعدة البيانات المحوسبة لمستشفى الأميرة رحمة التعليمي للأطفال لـ 1728 طفل تتراوح أعمارهم بين 6 أشهر و 12 عامًا في غرفة الطوارئ، وتم استبعاد الأطفال الذين يعانون من تعداد الدم الأبيض غير الطبيعي في وقت اختبار الهيموجلوبين، والذين يعانون من أمراض مزمنة، تم تحليل البيانات بالنسبة للعمر، والجنس، ومستوى الهيموجلوبين، وشدة فقر الدم، تم تعريف فقر الدم على أنه مستوى الهيموجلوبين الأقل من11 جم / ديسيلتر في الأطفال الذين تتراوح أعمارهم بين 6–59 شهرًا والأقل من 11.5 جم / ديسيلتر للأطفال الذين تتراوح أعمارهم بين 5–12 عامًا، وفقًا لمستويات الهيموجلوبين التي اقترحتها منظمة الصحة العالمية.

نتيجة: كان معدل الانتشار الإجمالي لفقر الدم لدى الأطفال الذين تتراوح أعمارهم بين 6 أشهر و12 سنة 24.9٪ (العدد = 431). بلغ معدل الانتشار الإجمالي لفقر الدم لدى الأطفال الذين تتراوح أعمارهم بين 6 أشهر و5 سنوات 32٪ (العدد = 351)؛ وكان الأطفال الذين تقل أعمارهم عن عامين أكثر عرضة للإصابة بفقر الدم بنسبة 39 ٪ (العدد = 241). وكانت غالبية حالات فقر الدم عند الأطفال من 6 أشهر إلى 5 سنوات 67.5٪ (351/237) من النوع الخفيف تليها 31.3٪ (110) حالات فقر دم معتدل و1.1٪ (4 (فقر دم شديد، وكان متوسط قيمة الهيموجلوبين للأطفال من 6 أشهر إلى 5 سنوات 11.4 جم / ديسيلتر. وكان معدل الانتشار الإجمالي لفقر الدم لدى الأطفال الذين تتراوح أعمارهم بين 5–12 سنة 12.7٪ .(N = 80) غالبية حالات فقر الدم لدى الأطفال الذين تتراوح أعمارهم بين 5–12 سنة كانت 57.5٪ من النوع المتوسط تليها 40٪ من النوع الخفيف و2.5٪ فقر الدم الحاد، وكان متوسط قيمة الهيموغلوبين للأطفال من 5 سنوات إلى 12 سنة 12.8 جم / ديسيلتر.

خاتمة: نظراً لارتفاع معدل انتشار فقر الدم لدى الأطفال في شمال الأردن، ولاسيما بين من تقل أعمارهم عن 5 سنوات، وبالنظر إلى الآثار السلبية على نموهم المعرفي والسلوكي حتى في السنوات اللاحقة، فهناك حاجة ملحة لتدخلات صحية عامة فاعلة وفعالة، في أبريل 2002، وبدأ الأردن برنامج إغناء دقيق القمح شمل الحديد، وحمض الفوليك، ولكن على الرغم من هذا البرنامج الوطني للتحصين، ولم يكن هناك تغيير ذو دلالة إحصائية في انتشار فقر الدم مما يشير إلى أن الأسباب الأخرى (إضافة إلى نقص الحديد) هي المسؤولة عن فقر دم.

الكلمات الدالة: فقر الدم، مسح صحة الأسرة للسكان في الأردن، وزارة الصحة الأردنية، منظمة الصحة العالمية، الأطفال.