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Prevalence and Predictors of Iron Deficiency Anemia among Children in Saudi Arabia

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Abstract

Introduction: The long-term impact of iron deficiency anemia on female children was significantly reducing physical growth, neurological development and learning performance. There is limited data about the magnitude of iron deficiency anemia in Saudi Arabia in young children. This study aimed to assess the prevalence and determinants of iron deficiency anemia in children attending primary health care at age of the school entry.

Methods: This is a cross-sectional study included children were included at age of school entry and they should be tested for detection of anemia after their parents sign an informed consent. Children with other types of anemia were excluded from this study. The minimal sample size is calculated using Raosoft calculator based on the equation for proportion estimation. Based on this proportion, at the confidence level of 95% and estimation error of 0.05 the initial sample size is calculated to be 384 participants. A questionnaire was used to collect data from the mothers or caregiver for the children.

Results: A total sample of 384 attendants in PHC centers responded to the questionnaire, of them 59.5% were males. About 68% of the mothers have a high level of education as university or postgraduate studies and 83% were married. The prevalence of anemia was found to be 24% among children for both genders. Only nationality was a significant predictor for iron-deficiency anemia among children. Saudis children had significantly lower prevalence of anemia than non-Saudis.

Conclusions: The prevalence of anemia among children at age of school entry was high and more attention to the nutritional habits of children should be given by mothers and health specialists. Educational campaign should be conducted to increase awareness about proper children nutrition among women, particularly women with non-Saudi nationality.

Keywords: Iron, Anemia, Children, Mothers, Saudi

Introduction

Anemia is a disease characterized by reduced amount of erythrocytes, usually associated with reduction in hemoglobin level or alteration of erythrocyte morphology [1]. Anemia has different classifications depends on physiological and pathological basis. It is a multifactorial disease with different genetic, nutritional, and pathological determinants. Iron deficiency anemia is one of the common microcytic anemia that affects children and can lead to a significant reduction in the cognitive skills. The poor oxygen delivery to the tissues can lead to weakness, poor concentration, and low learning performance in children [2].

Based on the global estimation, the prevalence of anemia was 32.9% which lead to 68.4 million of disability adjusted life years in 187 countries. Iron deficiency is the most common cause of anemia, particularly in females. Regarding age, young children have the highest prevalence and severity pattern in the developing countries [3]. World Health Organization (WHO) recommended the prioritization of this age group in the prevention and control of iron deficiency anemia. The recent guidelines recommended improving the nutrition with daily iron supplementation for those at high risk of iron deficiency anemia [4].

The prevalence of iron deficiency anemia in Jeddah was higher to that reported in other regions in Saudi Arabia. The authors from King Abdelaziz University reported a prevalence of 23% with higher prevalence among older children. They found no significant associations between size of the family and mothers' educational level [5]. The long-term impact of iron deficiency anemia on female children was significantly reducing physical growth, neurological development and learning performance. There is limited data about the magnitude of iron deficiency anemia in Saudi Arabia in young children.

Methods

This is a cross-sectional study aimed to assess the prevalence and determinants of iron deficiency anemia in children attending primary health care at age of the school entry. Children were included at age of school entry and they should be tested for detection of anemia after their parents sign an informed consent. Children with other types of anemia were excluded from this study.

The minimal sample size is calculated using Raosoft calculator based on the equation for proportion estimation. Based on this proportion, at the confidence level of 95% and estimation error of 0.05 the initial sample size is calculated to be 384 participants.

A questionnaire was used to collect data from the mothers or care giver. It consists of two sections, the first section questioning about demographic and background variables and nutritional determinants of the children. The second section is a check list for collecting data about, hemoglobin level, diagnosis, and past medical history. The mothers were interviewed by the researcher or trained data collectors to fill in information for section A of the questionnaire. The patients' record were checked to collect data about section B. The main outcome was the prevalence of iron deficiency anemia among the included children.

The data were coded and introduced to the Statistical Package of Social Sciences (SPSS, version 26). The data were analyzed to present the findings in the descriptive and inferential statistics. The descriptive statistics include frequencies and percentages for categorical variables, while means, median and standard deviations were used to summarize numerical data. The chi-square test were used to detect significant differences in categorical variable, while t-test and ANOVA were used to compare means of continuous variables. The significant associations

between demographic and background variables were detected at < 0.05 significance level.

Results

A total sample of 384 mothers in PHC centers responded to the questionnaire, of them 59.5% had male children. The vast majority of the respondents were Saudis while a half of the respondents have middle income (5000-15000 Saudi Riyal). About 68% of the mothers have a high level of education as university or postgraduate studies and 83% were married (table 1).

The prevalence of anemia was found to be 24% among children for both genders. Table 2 shows the association between anemia and sociodemographic characteristics of the mothers and children. The prevalence of anemia was higher among children with low educated mothers than among those with highly educated mothers. However, the difference was statistically non-significant. Similarly, females has slightly higher prevalence of anemia than males without statistically significant difference. Only nationality was a significant predictor for iron-deficiency anemia among children. Saudis children had significantly lower prevalence of anemia than non-Saudis.

Discussion

The WHO estimated that about half of the preschool children are affected with different types of anemia, most of them due to nutritional causes and mainly caused by iron deficiency [6]. In the developing countries, anemia among preschool children strongly associated with income and education level of the parents. Generally, females are more affected by iron deficiency anemia than males. However, a higher percentage of male children affected by iron deficiency anemia than females in many developing countries. This could be attributed to the higher prevalence of hookworm among male children in those countries. Some screening programs were found very useful in early detection of anemia among young children [7].

In Saudi Arabia, a recent study conducted in 2019 among 2415 children attended hospitals in Abha and Khamis Mushait, found a prevalence of 26.4%. The

Table (1): Demographic characteristics of the children

Variables	Frequency	Percent (%)
Gender of the child		
Male	201	59.5
Female	137	40.5
Marital status of the mother		
Married	289	83.0
Single	57	16.4
Divorced	2	0.6
Educational level of the mother		
Illiterate	2	0.6
Primary School	8	2.3
Secondary School	100	28.7
University level	201	57.8
Postgraduate level	37	10.6
Nationality		
Saudi	329	95.9
Non-Saudi	14	4.1
Family Income		
< 5000	63	19.0
5000-15000	167	50.3
> 15000	102	30.7

majority of those children had mild anemia, while only 0.8% had severe anemia [8]. A slightly lower prevalence of 22.3% reported by a community based cross-sectional conducted among 1117 school-aged children in Riyadh region [9]. They reported that usual

eating of meat is a significant reducing factor of anemia, while drinking of cola was found as a significant risk factor of anemia [9].

Table (2): Prevalence and determinants of Iron-deficiency anemia among the children

Characteristics	HB level		P value
	Normal	Anemia	
Educational level of the mothers			
High school or lower	312 81.3%	72 18.7%	0.195
University or higher	325 84.6%	59 15.4%	
Gender of the child			
Male	298 77.5%	86 22.5%	0.239
Female	286 74.6%	98 25.4%	
Nationality			
Saudi	327 85.2%	57 14.8%	0.003*
Non-Saudi	24 73.9%	10 26.1%	

The common patterns of anemia were reported in a large study included 5381 children from different geographical region in Saudi Arabia. The findings showed a prevalence of 24.8% with majority of hypochromic-microcytic anemia in southern and western regions, where Jeddah city is located [10].

The estimation of the magnitude of this public health problem is very important for the planning of the intervention program. Furthermore, school health can contribute effectively in the nutritional and

educational control strategies which may be implemented by Ministry of Health.

Conclusions

The prevalence of anemia among children at age of school entry was high and more attention to the nutritional habits of children should be given by mothers and health specialists. Educational campaign should be conducted to increase awareness about proper children nutrition among women, particularly women with non-Saudi nationality.

Conflict of interests

The authors declared no conflict of interests.

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