

Anaemia among school children aged 6-11 years old in Gaza Strip, Palestine.

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الخلاصة: هدفت الدراسة الحالية إلى تحديد مستوى شيوخ فقر الدم بين أطفال تتراوح أعمارهم من 6-11 سنة لأسباب غير الإصابة بالأمراض الطفيلية بين هؤلاء الأطفال. اشتملت الدراسة المقطعية الحالية على 1446 طفل من أطفال المدارس من كلا الجنسين وكانوا موزعين على ثلاثة مناطق (خان يونس، غزة، بيت لاهيا) في قطاع غزة. تم تحديد مدى الأنيميا (فقر الدم) بين هؤلاء الأطفال بواسطة إيجاد متوسط الهيموجلوبين والذي وصل معدله إلى 12 g/dl وهي مشابهة لمعايير منظمة الصحة العالمية. دلت النتائج الحالية على أن معدل شيوخ فقر الدم كان 34% بين الأولاد و 36.3% بين البنات مع معدل شيوخ عام وصل إلى 35.3%. لم تظهر النتائج أى اختلاف فى شيوخ فقر الدم فى المناطق الثلاثة: لا يزال يشكل فقر الدم أحد المشاكل الصحية بين أطفال المدارس بنسبة شيوخ 35.3% ويتوقع أن تكون نسبة شيوخ الأنيميا أعلى من النسبة التى سجلتها هذه الدراسة نتيجة الحصار الاسرائيلى على قطاع غزة.

ABSTRACT

The objective of the study was to determine the prevalence of anaemia among children aged 6-11 old years due to causes other than parasitic infections. The present study was a cross-sectional study that included 1446 school children of both sexes, distributed in three localities (Khanyounis, Gaza and Beit-lahia) of Gaza strip. The cut-off point for anaemia was determined according to the mean of haemoglobin for all studied school age children, which was (12 g/dl) in accordance to WHO criteria. The observed mean level of Hb was 12 g/dl; standard deviation was 0.915 while the normal value is ranged between 8.9-15.2. Anaemia was found slightly higher in girls (36.3%) than boys (34%). The results showed that anaemia constitute a health problem in Gaza with a prevalence of 35.3%. No variation in the prevalence of anaemia among the three studies areas. It is concluded that anaemia still constitutes a health problem among schoolchildren with a present prevalence among school-age children of 35.3%. It is expected that the prevalence of anaemia may be higher than that reported by this study due to Israeli siege to Gaza Strip.

Key words: anaemia, children, region, prevalence, haemoglobin level, cut-off value.

Introduction

Anaemia is a serious public health problem in low- and middle-income countries, especially among women of child-bearing age (15-49 years old) and their children [1]. Iron-deficient populations are also more susceptible to infectious diseases [2], because the immune system is adversely affected. According to WHO, globally, anaemia affects a 1.62 million person, which corresponds to 24.8% of the World population [3]. Anaemia is one of the health problems

prevalent in Gaza Strip [4]. Normally the cut-off level of haemoglobin (Hb) for determination of anaemia among school-age children is 12 mg/dl in Gaza Strip [4] according to WHO recommendations. In the Eastern Mediterranean Region (EMR), more than 140 million people are estimated to be anaemic according to WHO criteria [5]; most of those are women of child-bearing age (15-49 years old), and their children [1]. These target groups need a higher quantity of iron because of growth, menstruation and

pregnancy. Iron-deficient people are more susceptible to infectious diseases [2]. Anaemic people also suffer from fatigue, low productivity at work, impairment of reproductive functions and retardation of physical and mental development [6]. The major factors affecting anaemia include the bioavailability of iron in the diet and poor absorption due to the presence of absorption-inhibiting factors, such as tea (tannin) and unleavened bread (phytate). In the Eastern Mediterranean Region, drinking tea is a common tradition. It appears that even infants consume a large quantity of tea, as a supplement to breast-feeding. Several criteria have been established to identify anaemia. The most widely used screening test is haemoglobin determination. Studies on Brazilian, Omani, Indian and Egyptian school-age children determined an anaemia cut-off value of 11.5g/dl [7, 8, 9, 10]. Halileh and Gordon [11] reported a haemoglobin cut-off value of 11g/dl among pre-school children in the Occupied Palestinian Territory (the cut-off value is different for male and females). A previous study in Gaza chose a cut-off haemoglobin level of 12 gm/dl, based on WHO data at that time [4]. Nowadays, most primary health care centres in Gaza strip use automated haematology analyzers, and it is essential to propose a clear cut-off level of haemoglobin determination. This will lead to effective interpretation and prevent unnecessary further investigations. In this study, we investigated the distribution of haemoglobin values and estimated the prevalence of anaemia among 6-11 year-old school children of both sexes in three different areas in Gaza strip.

The main objectives were:

1) To determine the prevalence of haemoglobin levels.

2) To determine the socioeconomic factors associated with anaemia in this age group.

Subjects and Methods

The target group

School children of both sexes were targeted, in three localities, Khanyounis, Gaza and Beit-lahia. Khanyounis represents the southern area of the Gaza Strip, while Gaza represents the central area and Beit-lahia represents the north-eastern area.

Selection criteria

Stratified sampling for age and sex was used throughout this study, random samples were chosen from each stratum [12]. The number collected from the schools children in three localities of Gaza strip was as follow: Khanyounis 478, Gaza 465 and Beit-lahia 503. All children were subjected to medical examination by school health staff in each school. Stool and blood examination were done for each child, and those in whom no disease other than anaemia was detected were selected. Examination of stool specimen was done by the author where each child delivered one stool specimen which inspected in the Biology Department laboratories, by the wet mount using saline and iodine.

Exclusion criteria

Children complaining of any disease as reported and examined by school health. Children with parasites infection were also excluded.

Inclusion criteria

Children aged between 6-11 years of both sexes who did not meet the excluding criteria were included in the study.

Sample size selection

Sample size was determined using conservative sample ($P=0.05$) with 0.03 of estimated error in 95% CI which give the sample size of 1450. Four children were excluded as non-responders.

Determination of Haemoglobin level

The range of anaemic children was determined according to the mean blood haemoglobin for all studied school age children, which was 12 g/dl in accordance to WHO criteria. Children whose haemoglobin was less than 12 mg/dl were considered to be anaemic and whose haemoglobin was more than 12 mg/dl were considered normal. Venous blood sample was drawn from each child and transported in EDTA containing tubes to the Medical Technology Department, Faculty of Science, and the Islamic University of Gaza. Blood was analyzed by an automated system cell counter (Cell Dyne 1700). The following indices were measured; haemoglobin (Hb), Haematocrit (Hct), Mean cell volume (FI), Mean cell haemoglobin (MCH), Mean cell haemoglobin concentration (MCHC).

Ethical consideration

All children's' parents or or guardians were informed in writing about the purpose of the study, the day before blood collection and informed that the authors will withdraw 5 ml of venous

blood from the child. Children given permission by their parent(s) or guardian(s) were included in the study. The health and education departments in UNRWA approved the permission.

Statistical analysis

Data were analyzed using SPSS/PC (Statistical Package for the Social Science version 8). The following statistical tests were used: Frequency distribution, cross tabulation, chi-square test (χ^2), the One-way ANOVA, the independent-sample t-test. Microsoft. Excel version 6 was used for graph plotting. The results were accepted as statistically significant when the p-value was less than 5% ($p<0.05$).

Results

The results of haemoglobin for both boys and girls showed that the Hb levels were represented by the standard normal distribution. Anaemia was slightly higher in girls (36.3%) than boys (34%), but no significant difference was found ($\chi^2=0.826$, $df=1$, $p=0.197$), P-value for Fisher's Test. The present findings indicate that the mean level of Hb was 12 mg/dl; standard deviation was 0.915 while the haemoglobin values ranged between 8.9-15.2. Table 1. shows that the highest prevalence for anaemia was in Beit-lahia and the percentage was 39.0% ($\chi^2=7.422$, $df=2$, $p=0.04$).

Table 1. Anaemic and non-anaemic school-age children in the three localities of the Gaza Strip (n=1446).

	Khanyounis (n=478)		Gaza (n=465)		Beit-lahia (n=503)		P-value
	No.	%	No.	%	No.	%	
Anaemic	168	(36.1)	147	(30.8)	196	(39.0)	0.04
Not-anaemic	297	(63.9)	331	(69.2)	307	(61.0)	

($\chi^2=7.422$, $df=2$, $p=0.04$).

It was found that, Haseeba hejawe and Maan had similar prevalence of anemia as represented in table 2. While Fify Al-Bayari had the lowest prevalence of anaemia. There was a real difference

between schools regarding prevalence of anaemia with Amnaa Shehataa School which showed the highest prevalence and Aify Al-Bayari School which showed the lowest prevalence.

Table 2. Distribution of Anaemic and non-anaemic school-age children due to schools in the three localities of the Gaza Strip (n=1446).

School name	Number examined	Anaemic No. %	P-value
Fify Al-Bayari	252	64 (25.4)	0.006
Royda Al-ottol	262	97 (37.0)	
Haseeba hejawe	299	109 (36.5)	
Salah Abu-Rizik	219	77 (35.2)	
Amnaa Shehtaa	183	79 (43.2)	
Maan	231	85 (36.8)	

($\chi^2=16.517$, $df=5$, $p=0.006$).

Discussion

Anaemia, defined as haemoglobin concentration below established cut off levels [13], is a widespread public health problem with major consequences for human health as well as social and economic development. As reported by Hassan [14], it was found that the prevalence of anaemia was high (67%) among Palestinian children 6 through 35 months of age living in Palestinian refugee camps in Syria, Jordan, the West Bank, Gaza Strip and Lebanon. With comparison with neighbouring countries anaemia varies from area to area like; Egyptian children 12% [10]; Saudi children 24.8%; [15] ; Omani children 37.9% [8]; Iranian children 15% [16] and Turkish children 7.8% [17]. The present study indicated that the prevalence of anaemia among school-age children was 35.3%. Most studies carried out on anaemia in Gaza strip

used the same cut off point (12 g/dl) which applied in the present study [4], other used 11 g/dl [18]. According to the WHO a study conducted by UNRWA in 2005 to assess the prevalence of anaemia among first and ninth grade school children revealed that the overall prevalence of anaemia among schoolchildren was 23.9% in Gaza and 14.7% in the West Bank. The same study indicated that the prevalence of anaemia in some pockets was much higher than others. Alarming rates were reported among first grade school children from Khanyounis at 59.9%, from Jabalia 52.3% and from Rafah 30.4% [19]. Our findings for the prevalence of anaemia in Beit-lahia was the highest (39.0%) compared to the other two localities. Variation of anaemia among the three localities seems to be similar because all residents live in the same

conditions of food habits and same socioeconomic status.

The nutritional status of schoolchildren was reported in many studies in Palestine and may be associated with anaemia due to deficiency in food and the essential requirements. Poor eating habits play a major role in the development of the iron deficiency anaemia that is an important indicator of poor health status [20]. In the local community the eating of potato chips, and habitual drinking of tea during meals and drinking cheap juices containing dyes may have contributed to anaemia among school-age children in Gaza Strip. High poverty rates have also led to increased food insecurity based on limited access to food due to curfews and closures as well as high unemployment, depletion of resources, and the strained social support networks [19]. Intestinal parasitic diseases were reported in different studies in Gaza Strip and have been shown to be associated with anaemia among school-age children in Gaza [4]. Malaria disease does not exist in Gaza Strip due to the absence of *Anopheles* mosquitoes. Thalassaemia, one of the factors correlated to anaemia in Gaza, was reported by Sirdah et al. [21], to have a prevalence of 27.1% for the beta trait. Physiological features are very important variables since children and adolescents are at an increased risk of developing iron deficiency anaemia because of their increased demand for iron during growth and puberty [22]. This may explain why girls are more susceptible to anaemia than boys, as observed in the present study. Inability to reach medical services may influence the receiving of medical attention in Gaza strip. The difficult economic situation, siege and closure of the Gaza Strip have added new obstacles to receiving regular medical services. The big family size in

Palestinian community, which ranges from 4-16 individuals, makes the father or guardian generally unable to bring all requirements to each member of the family, increasing susceptibility for diseases. Malnutrition was reported in different studies in Gaza strip and represents evidence of the causes of anaemia.

Conclusions:

- It is concluded that anaemia still constitutes a health problem among school children with the present prevalence among school-age children 35.3%.

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