Evaluation of Nutritional Anemia in Middle Eastern Migrant and Refugee Children

Ortadoğulu Göçmen ve Mülteci Çocuklarda Aneminin Değerlendirilmesi

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ABSTRACT

Objective: Anemia is defined based on low blood hemoglobin concentration and the worldwide prevalence of anemia is estimated as high as 24.8% according to the World Health Organization (WHO). Today health systems are facing the problems. and medical issues of an ever- growing refugee population. This study was planned to investigate nutritional and iron deficiency anemia in immigrant and refugee children.

Material and Methods: In this study immigrant and refugee patients aged 0-18 years who applied to the Pediatric Clinics of Tepecik Training and Research Hospital for any reason between the years 2012-2018 were retrospectively evaluated. Patients who were admitted to the hospital for any reason and whose hematological parameters were coded were included in the study.

Results: Study population consisted of 4840 cases including 2234 (46.2%) girls and mostly (n=4793:99.0%) Syrians .Mean age at admission was found as 47.67±57.79 (0-226) months. Mean values for various parametres were as follows: hemoglobin (Hb) (10.8±1.5 gr/dL), hematocrit (Hct) (32.8±4.3%), MCV (75.9±9.6 fL) , RDW (14.9±2.5%), serum iron (46.41±36.6 µg/dL), iron binding capacity (IBC) (379.52±75.98 g/dL), transferrin saturation (TS) (11.95±9.7%), serum ferritin (94.5±452µg/L). Hemoglobin levels were ≤ 10 gr/dL in 331 (6.8%) and ≤ 8 gr/dL in 83 (1.71%) cases. Biochemical parametres of iron status could not be assessed in all patients. Serum iron (n=838), IBC (n=748), TS (n= 748), and ferritin (n= 737) were evaluated in indicated number of patients. Menzter, Shine&Lal, and England indexes were calculated to evaluate the iron deficiency parameters of patients with lower age-adjusted MCV values. Total number of 1525 (incl. 714[46.8%] girls) cases had lower limit of normal MCV values and Menzter index of > 13. There was a significant relationship between MCV, IBC (p=0.033, r=-0.124) and TS (p=0.000, r=-0.232). While MCV was in the lower limit of normal and there were 1934 (886 girls) with Shine index of > 1530, and no relationship was found between MCV and any iron parameters. A total of 1277 patients had a England index of > 0 and a correlation was found only between MCV and TS saturation (p=0.001 and r=0.222).

Conclusion: Although our study had a retrospective design and inadequate data, it is noteworthy in that it has determined the prevalence of anemia in this population.

Key Words: Anemia, Child, Migrant, Nutrition

ÖZ

Amaç: Anemi, düşük kan hemoglobin konsantrasyonuna göre tanımlanır ve Dünya Sağlık Örgütü'ne (DSÖ) göre dünya çapında anemi prevalansının % 24.8 kadar olduğu tahmin edilmektedir. Günümüzde sağlık sistemleri sürekli büyüyen mülteci nüfusunun tıbbi sorunları ile karşı karşıyadır. Bu çalışma, göçmen ve mülteci çocuklarda beslenme ve demir eksikliği anemisinin araştırılması amacı ile planlandı.

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Gereç ve Yöntemler: Bu çalışma Tepecik Eğitim ve Araştırma Hastanesi Çocuk Klinikleri'ne 2012-2018 yılları arasında herhangi bir nedenle başvuran 0-18 yaş arası göçmen ve mülteci hastalar geriye dönük incelenerek yapıldı. Herhangi bir nedenle hastaneye başvuran ve hematolojik parametreleri kodlanan hastalar çalışmaya alındı.

Bulgular: Çalışma popülasyonu 2234 (%46.2) kız ve çoğunluğu (n= 4793, %99.0) Suriyeli olmak üzere 4840 vakayı kapsamaktadır. Ortalama başvuru yaşı 47.67±57.79 (0-226) ay olarak bulundu. Çeşitli parametreler için ortalama değerler şöyleydi: hemoglobin (Hb) (10.8±1.5 gr/dL), hematokrit (Hct) (%32.8±4.3), ortalama eritrosit hacmi (MCV) (75.9±9.6 fL), eritrosit dağılım genişliği (RDW) (%14.9±2.5), Serum demiri (46.41±36.6 µg/dL), demir bağlama kapasitesi (IBC) (379.52±75.98 µg/dL), transferrin satürasyonu (TS) (11.95±%9.7), serum ferritin (94.5±452 µg/L) Hemoglobin seviyeleri 331 (%6.8)'de ≤ 10 gr/dL ve 83 (%1.71) vakada ≤ 8 gr/dL'di. Demir durumunun biyokimyasal parametreleri tüm hastalarda değerlendirilemedi. Belirtilen hasta grubunda serum demir (n=838), IBC (n=748), TS (n= 748) ve ferritin (n=737) değerlendirildi. Menzter, yaşa göre ayarlanmış MCV değerleri düşük olan hastaların demir eksikliği parametrelerini değerlendirmek için Shine&Lal ve England indeksleri hesaplandı. Toplam 1525 (714 (%46.8 kız) dahil) normal MCV değerlerleri alt sınırı ve Menzter indeksi > 13'dü. MCV arasında anlamlı bir ilişki vardı. IBC (p=0.033, r=-0.124) ve TS (p=0.000, r=-0.232). MCV normalin alt sınırındayken ve 1934 (886 kız) Shine indeksi> 1530 iken, MCV ile demir parametreleri arasında ilişki bulunmadı. Toplam 1277 hastada England indeksi > 0 iken sadece MCV ve TS arasında bir korelasyon bulundu (p=0.001, r=0.222).

Sonuç: Çalışmamız retrospektif bir tasarıma ve yetersiz verilere sahip olmasına rağmen, bu popülasyonda anemi prevalansını belirlemesi dikkat çekicidir.

Anahtar Sözcükler: Anemi, Çocuk, Göçmen, Beslenme

INTRODUCTION

Anemia is a prevalent medical disorder that is described by low blood (Hb) level and it is widespread not only in low income countries, but also in countries with high socioeconomic standards (1). The World health organization (WHO) reports the worldwide prevalence of anemia as 24.8% (2). Anemia affects the development of motor and cognitive functions in children and has negative effects on reproductive health in adults and reflects its negative effects on socioeconomic development. Under normal physiologic conditions, erythrocyte production and destruction are in balance. Disruption of this balance causes anemia. Children are particularly at risk and iron deficiency anemia, rapid growth and inadequate iron intake with insufficient nutritional support are the most important issues faced by this group (3-6). As indicated by WHO, anemia is a worldwide disease burden and represents an increased perinatal risk for the mother (7, 8). There may be only one cause of anemia, yet it generally develops under the influence of multiple pathogenetic factors (9). Iron deficiency is the most widely recognized triggering cause of anemia (10). Other significant causes include different micronutrient deficiencies (folate, B12, vitamin A or B2 deficiency), infections (HIV, tuberculosis) and hemoglobinopathies (11). Today, Turkey is affected by a large wave of immigration coming from Middle East and especially from Syria. Because of the recent developments in the world and the new conditions created by the socio-economic development of our country, our country has received migration, become a transition zone for incoming migrants and hosted a relatively more permanent immigrant population. As of February 2020 approximately 4 million refugees mostly Syrians, followed by Afghani, Iraqis, Iranians, Somalians and other nationalities in order of decreasing frequency are residing in Turkey and this number is increasing as time passes. Migrants are camping in various places of Turkey as well as settling in villages and cities (12). Although migration affects all family members, it is clear that children are affected mostly from these unfavourable circumstances. Various health issues experienced by these children have taken an important place in the current health system of our country (12). Migrant and refugee populations have a challenging effect on health systems. In this population, children are the group that is at higher risk because of inability to access health services, especially the ones with many physical and mental health problems. Prevalence of infectious diseases and suboptimal conditions increase during migration (13). These people are confronted with malnutrition, secondary nutritional deficiency diseases, poisoning, and psychiatric diseases brought together by stress (14). According to the Centers for Disease Control (CDC) studies, children and adolescents from Bhutan and Syria have different degrees of acute and chronic malnutrition. Acute malnutrition has been reported in 0.8-1.2% of Syrian refugees (15). This study was planned to investigate nutritional and iron deficiency anemia in immigrant and refugee children who applied to a tertiary Tepecik Training and Research Hospital in Izmir Province situated in the western part of Turkey.

MATERIAL and METHOD

The study was conducted retrospectively with the assessment of immigrant and refugee patients aged 0-18 years who applied to the Pediatric Clinics of Health Sciences University Tepecik Training and Research Hospital under any circumstances. between the years 2012 and 2018. Patients who admitted to the hospital and whose hematological parameters were coded were included. in this descriptive study. All variables were obtained retrospectively from the hospital information processing system.Approval for the study was obtained from the local ethics committee of the hospital (Ethics committee

approval no: 2019/2-6). Our aim was to obtain information about the age. sex. complete blood count and iron parameters of the cases. Since only nutritional anemia was aimed to be evaluated in these cases, some indices have been used to exclude thalassemia major and thalassemia carriers. Although there are many indices defined for this purpose, three of them were used in this study so as to try to make a distinction among iron deficiency cases. For this purpose, Menzter, Shine & Lal and England indexes were used. Mentzer index was calculated as the ratio of mean corpuscular volume (MCV) / the red blood cell count (RBC). If the ratio is > 13, this result favours iron deficiency anemia. The Shine & Lal index was calculated with the formula MCVxMCV x (mean corpuscular hemoglobin) MCH / 100. The index > 1530 was accepted in favor of iron deficiency anemia. England index was calculated with the formula MCV-RBC-(5x Hb)-3.4 and positive results (> 0) were evaluated as iron deficiency.

Statistical Analysis

The data were evaluated in the IBM SPSS Statistics Standard Concurrent User V 25 (IBM Corp. Armonk. New York. USA) statistical package program. Descriptive statistics were given as number of units (n), percentage (%) mean ± standard deviation ($\bar{x}\pm$ ss), median (M), the smallest (min), and the greatest (max) values. The normality of distribution of data for numerical variables was evaluated by Shapiro -Wilks normality test and Q-Q graphs. The homogeneity of the variances was evaluated by Levene test. The relationship between numerical variables was analyzed by Pearson correlation analysis, and the relationship between categorical variables by using Spearman correlation coefficient. In this study, since the MCV values and iron data were expressed as numerical data the Pearson correlation coefficient was used. In addition, correlation coefficients were evaluated for MCV and serum iron binding capacity (IBC), MCV and transferrin saturation (TS), MCV and ferritin. $p < 0.05$ value was considered statistically significant.

RESULT

A total of 4840 patients were admitted to the hospital within the specified time interval. A total of 2234 (46.2%) cases were female and 4793 (99.0%) cases were Syrians, followed by Iraqis (n=19:0.4%), Afghans (n=15 :0.3%), Palestinians (n=6 :0.1%), Iranians (n=4), Qataris (n=1), Lebanese (n=1) and, Saudi Arabians (n=1). Mean age at admission was found as 47.67±57.79 (0-226) months. Mean values for the following parameters were as follows: Hb (10.8±1.5 gr/dL), Hct (32.8 ± 4.3 %), MCV (75.9±9.6 fL), RDW (14.9±2.5 %), serum iron (46.41±36.6 µg/dL), IBC (379.52±75.98 µg/dL), TS (11.95±9.7 %), serum ferritin (94.5±452 µg/L) (Table I). Serum hemoglobin levels were ≤ 10 gr/dL in 331 (6.8%) and ≤ 8 gr/dL in 83 (1.71%) cases. In order to identify cases with iron deficiency correlation analyses were employed in patients whose age-matched MCV values were at lower limits of normal using their serum iron parameters, and indexes. Menzter, Shine&Lal and England indexes were calculated to evaluate iron deficiency parameters of patients with lower than normal age adjusted MCV values. A total of 1525 (incl. 714 [46.8%] girls) cases had MCV at lower limit of normal and Menzter index of >13. There was a significant relationship between MCV and IBC (p=0.033; r=-0.124) and TS (p=0.000 r=0.232). While MCV was at the lower limit of normal, and there were 1934 (incl. 886 girls) cases with Shine index of > 1530 without any correlation between

Table I: General characteristics of the cases and their basic laboratory parameters.

Parameter	Result
Sex	2234 (46.2%) female infants
Mean age	47.67±57.79 (0-226) months
Nationality	
Syria	4793 (99.0%)
Iraq	19 (0.4%)
Afghanistan	15 (0.3%)
Palestine	6 (0.1%)
Iran	4
Qatar	1
Lebanon	1
Saudi Arabia	1
Complete blood count parameters Hb (g/dL)	10.8±1.5
Hct (%)	32.8±4.3
MCV (µmm^3)	75.9±9.6
RDW (%)	14.9±2.5
Serum Iron Parameters	
Iron (µg/dL)	46.41±36.6
Iron Binding Capacity (IBC) (µg/dL)	379.52±75.98
Transferrin saturation (TS) (%)	11.95±9.7
Ferritin (mg/dL)	94.5±452

Table II: Evaluation of the cases which have the MCV at the lowest limit according to age using the indexes Mentzer, Shine, and England.

Index	Number (n) F/M	Hb (g/dL) (mean±SD)	Iron (µg/dL) (mean±SD)	IBC (µg/dL) (mean±SD)	TS sat (%) (mean±SD)	Ferritin (mg/dL) (mean±SD)
Menzter> 13	1525 714/ 811	10.8±1.28	46.15±34.5	377.8±78.0	11.35±9.2	102.06±500
Shine > 1530	1934 886/1048	10.8±1.12	46.48±36.6	380.05±75.3	11.94±9.7	94.42± 454
England >0	1277 609/668	10.72±1.4	45.7±34.8	376.25±80	11.8±9.7	104.66±533

IBC:*Iron binding capacity,* ***TS:*** *Transferrin saturation*

Table III: The Relation of MCV with Iron Parameters According to Indexes.

MCV	Iron	IBC	TS	Ferritin
Menzter >13	p=0.397	p=0.033 r=-0.124	p=0.000 r=0.232	p=0.072
Shine >1530	p=0.651	p=0.075	p=0.447	p=0.051
England >0	p=0.503	p=0.107	p=0.001 r=0.223	p=0.108

r: *Correlation Coefficient,* ***IBC:*** *Iron binding capacity,* ***TS:*** *Transferrin saturation*

MCV and any one of iron parameters. A total of 1277 cases had an England index of > 0 and a relationship was detected only between MCV and TS saturation (p=0.001 and r=0.2223) (Table II,III).

DISCUSSION

As a result of the Syrian civil war millions of Syrian refugees who had to leave their countries had to take refuge in our country to survive. Refugees confront many medical issues in the countries they immigrate to including inadequate living conditions, nutritional problems, living together in crowded environments and inability to access to preventive health services. Naturally, children are mostly affected by these unfavourable conditions (16). Children's health deteriorates due to inadequate access to nutrition, drinking water, sanitation, and healthcare services during the war. Malnutrition and infectious diseases are the most important health problems among refugee children. Child mortality, abus, injury, lack of education, and loss of family members are other problems emerging from war (17). The right to access to healthcare is a right that must be ensured and accompanied by economic and social rights. Above all, this right should be endowed to people to lead a healthy life. Since reproduction and childbirth are among the most fundamental life activities, it is necessary to fulfill them in a healthy way and to protect the health of the mother and the child. Likewise, providing healthy drinking water adequate access to foof and housing rights, ensuring basic environmental hygiene conditions, preventing, and at least reducing occupational diseases, accidents, environmental and industrial threats that endanger human health should be realized. The most widely recognized health problems in migrants are respiratory problems, skin infections, gastroenteritis, and traumas (18). In a study directed by El-Khatib Z, et al.(18) it was found that skin infections were most prevalent among Syrian immigrants (41%), followed by gastrointestinal diseases (23%), and respiratory tract infections (n= 517). In a study from Izmir it was expressed that the most common reason for admitting to the emergency department among Syrian immigrants was respiratory system diseases, gastroenteritis, trauma, and urinary system infections (19). In these publications, we see that the most common and prominent admission symptoms that made Syrian immigrants to apply to the emergency department have been evaluated. However nutritional deficiencies inaccessibility to micro-nutrients and the resulting vitaminmineral deficiencies and anemia have been mostly overlooked. Besides, these acute problems may lead to development of important health problems in the long term. The access of refugees to food safely in a newly resettled country is related to several factors. These are language proficiency and literacy, housing facilities, financial means, transportation opportunities, and food insecurity (20). Food insecurity means insufficient micronutrient, fiber, fruit and vegetable consumption with increased obesity and excess weight (21). In Western Australia. this food insecurity has been reported at a rate of 55.9% (22). Iron deficiency anemia (22.1%), vitamin D deficiency (39-87%), B12 and iodine deficiency (11.5-18.3%) have been reported as outcomes of pediatric malnutrition in developed countries (7-8,10-12). Different studies have shown that the presence of anemia in immigrants is a public health problem. Its prevalence in Nepalese and Australian immigrants has been shown to be 24% and 16.4%, respectively (23,24). The prevalence of anemia at reproductive age in Zaatari Syrian camp was 44.8%. Similarly, the incidence of anemia among Iranian children under 10 years of age has been reported to be 45% (25). Again, among Australian Karen immigrants, in Kenya Kakuma immigrant camp and seven immigrant camps in Nepal the prevalence of anemia was reported to be 8%, 46%, and

29%, respectively (26). Anemia is a parameter that should be evaluated according to age. Hemoglobin value of ≤ 10 mg/dL and ≤ 8 mg/dL were detected in 6.8% and 1.7% of the children, respectively. Our principal objective was to detect nutritional anemia. The results were also assessed using relevant indexes due to the missing sociodemographic and clinical data. The study has some important limitations, including its retrospective design and inability to obtain the variables completely. Therefore, data on the complaints of patients, the causes of anemia, whether the immigrants made recurrent applications and their previous treatments could not be obtained. In addition, it was not possible to obtain the sociodemographic information of all the patients. To increase the quality of life of refugees, it will be beneficial to determine their socio-economic profile and levels of education to improve Turkish language proficiency to reduce environmental risk factors and to take preventive health measures. Finally, Syrian refugees could receive inpatient treatment. The fact that they can benefit more from preventive healthcare services and improve their living conditions will decrease hospitalization and their morbidity. and contribute to the national economy.

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