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Research Article

Some Immunological and Hematological Parameters among Refugees in Kawergosk Camp – Erbil Governorate

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ABSTRACT

The study included 258 Syrian refugees of different ages and sex and another 60 volunteers as control group (C.G). These refugees were in Kawergosk camp in Erbil Governorate. Blood was collected from each individual for the estimation of white blood cell (WBC), eosinophil, iron, hemoglobin (Hb), and immunoglobulin E (IgE) levels. Mean serum levels of IgE among male and female refugees showed highly significant increasing when compared to C.G. Most of the refugees had normal iron levels, where iron concentrations were more than 65 mg/dl among 67 males and more than 50 mg/dl among 104 females and 48 children, while some had iron deficiency in which the majority were female (9 males, 24 females, and 6 children had iron deficiency). In addition, Hb concentrations were normal among 65 males (more than 13.0 g/dl), 89 females (more than 11.0 g/dl), and 48 children (more than 12.0 g/dl). However, anemia was found among 8 men, 42 women, and 6 children. It was revealed that there was a highly significant rising in eosinophils in male and female refugees in comparison to C.G. WBC count is non-significantly slightly increased in both male's and female's refugees when compared to C.G.

Keywords: Eosinophil count, hemoglobin, immunoglobulin E, iron, refugees, white blood cell count

INTRODUCTION

There are about 68.5 million people currently displaced around the world, and 25.4 million of them have crossed international borders seeking shelters and safety. Traveling and lodging in different places may cause ill health to many of the refugees, although their health status might have been quite well in their original homes. Falling ill may be because of poor living conditions in camps, poor sanitation, and lifestyle change that may include inadequate food and water and stress. All these conditions were well known to lead to depression.[1]

Erbil city currently has four refugee camps – Kawergosk camp, Qushtapa camp, Darashakran camp, and Basirma camp, that host around 50,000 Syrian refugees. Kawergosk refugee camp was the first camp to be established in Erbil in 2013 hosting refugees from the town of Qamishli in Syria. The overall situation of the camp is fair. However, there are two concerns – health and sanitation due to lack of advanced health services and limited availability of water supply.[2]

Due to displacement and lack of many health facilities, it is common that the general health of refugees might deteriorate with time. Moreover, communicable diseases are common among refugees including tuberculosis, HIV/AIDS, hepatitis, measles, and rubella.[3]

The aim of this study is to investigate the levels of white blood cell (WBC), eosinophil, iron, hemoglobin (Hb), and immunoglobulin E (IgE) levels among refugees in Kawergosk Camp – Erbil Governorate. The change in these parameters may be a predisposing factor to further disease development.

MATERIALS AND METHODS

The study included 258 Syrian refugees of different ages and sex and another 60 volunteers as control group (C.G). These refugees were in Kawergosk camp in Erbil Governorate. Forms were filled for each individual for information that included age, gender, case history, physical, and laboratory examination reports.

Four milliliter of blood were withdrawn from each refugee and C.G by sterile disposable syringes. Blood samples were divided into two parts – 2 ml were placed into ethylenediaminetetraacetic acid-containing tubes for the performance of hematological tests including WBC, eosinophil

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count, iron, and Hb and 2 ml of blood were placed into plain gel tubes and allowed to clot at room temperature, then centrifuged at 2500 rpm for 15 min for serum collection. The serum was transferred into two labeled Eppendorf tubes, 0.5 ml of serum in each and stored at −20°C for later estimation of IgE levels.

Determination of complete blood count was made using the automated hematology analyzer for all samples within 1 hour of sample collection. WBC, eosinophil, iron, and Hb were evaluated. The stored serums were used for estimating IgE after bringing them to room temperature, then determining IgE by an automated cobas e411 immunoassay analyzer and using its IgE kit (Roche company).

Statistical Analysis

Data were evaluated statistically, analyzed, and organized in tables. Computer program software – Statistical Package for the Social Sciences version 18 was used to analyze the data. Quantitative variables were compared using the Students *F*-test and independent *t*-test. Results were considered highly significant, if the $P < 0.01$; significant if the *P* value was between 0.01 and 0.05; and non-significant if the *P* value was more than 0.05.

RESULTS

WBC Count

Table 1 represents the mean WBC count. It reveals that WBC count is non-significantly slightly increased in both males and females refugee when compared to C.G ($P > 0.05$).

Eosinophil Count

The mean of eosinophil count of refugees in comparison to C.G. is shown in Table 2. It was revealed that there was a highly significant rise in eosinophils in male and female refugees in comparison to C.G. ($P < 0.01$).

Iron and Hb Levels

Figure 1 shows the level of iron among adult refugees (above 15 years of age) and children. Most of the refugees had normal iron levels, where iron concentrations were more than 65 mg/dl among 67 males and more than 50 mg/dl among 104 females and 48 children, while some had iron deficiency in which the majority was females (9 males, 24 females, and 6 children). In addition, Hb concentrations were normal among 65 males (more than 13.0 g/dl), 89 females (more than 11.0 g/dl), and 48 children (more than 12.0 g/dl).

Table 1: Mean WBC counts in refugees in Kawergosk camp in Erbil Governorate

Immunological parameter	Gender	No.	Mean±SE	No.	Mean±S	*t*-test	*P*
			Refugees suffer with asthma		(C.G)	*P* value	
WBC 10^9/L	M	121	7.91±0.57	30	6.74±0.47	0.123	N.S
	F	137	7.67±0.31	30	6.69±0.44	0.089	N.S

P: Probability, $P \geq 0.05$: Non-significant; WBC: White blood cell, SE: Standard error

Table 2: Mean of eosinophil count in refugees in Kawergosk camp in Erbil Governorate

Immunological Parameter	Gender	No.	Mean±SE	No.	Mean±SE	*t*-test	*P*
			Refugees suffer with asthma		(C.G)	*P* value	
Eosinophil 10^9/L	M	121	5.60±0.18	30	3.50±0.45	0.001	H.S**
	F	137	5.81±0.15	30	2.80±0.38	0.000	H.S**

P: Probability; $P \geq 0.05$: Non-significant; $^*P < 0.05$: Significant; $^{**}P < 0.01$: Highly significant. SE: Standard error

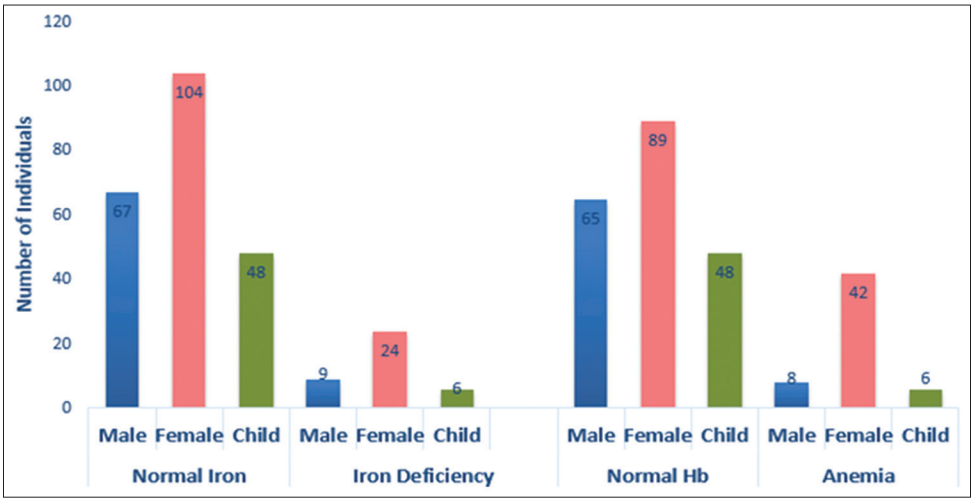

Figure 1: Iron and hemoglobin levels in refugees in Kawergosk camp in Erbil Governorate

However, anemia was found among 8 men, 42 women, and 6 children.

Data were compared between individuals regarding the relation of Hb to iron. The first group had normal Hb and normal iron; the females are the highest number with 98 females, 65 males, and 37 children. In addition, the second group was classified to have iron-deficiency anemia in which the highest deficient was among females (6 males, 20 females, and 2 children). Furthermore, the results have been recorded to have 2 males, 22 females, and 3 children that suffered from anemia, but their blood iron was within normal range. Moreover, it has been found that at least one of the males, females, and children had iron deficiency but had no anemia, as shown in Figure 2.

Serum IgE

Mean serum levels of IgE among male and female refugees showed highly significant increased levels when compared to C.G. ($P < 0.01$), as shown in Table 3.

DISCUSSION

The general health of most refugees has been found to be bad. There is no provision of basic health care, no clean drinking water, and no primary education for children.[4]

Although the WBC count was insignificantly increased in the current study, this may have several indications. These cells are very important constituents of blood. They play a vital role in combatting infections and stabilizing health the condition in an individual. A high WBC count may indicate that the immune system is stimulated due to the presence of an infection. Physical and emotional stress has also been found to cause an increase in the WBC count. The presence of some cancers in some people cannot be eliminated, which is another cause of increased WBC counts.[5]

Eosinophils are one of the WBC types that are an important component of the immune system. Causes of eosinophilia are many, but among refugees, it may be because of parasitic infections, allergies, or even asthma.[6] In the current study, eosinophilia was prominent among the studied group. The presence of other infections or asthma cannot be excluded in these people, for a lot of them did show signs of asthma.

Refugees of all ages and ethnicities have been found to have anemia. The prevalence of anemia in newly arrived populations has ranged from 19% among African refugees resettling in Australia to 37% among Southeast Asian refugees resettling in the United States.[7,8] Anemia was identified in 12% of 1247 refugee children in Massachusetts, with a rate of 29% among children under 2 years.[9] In addition, a study in Maine found that 20% of 127 refugee children were anemic at the time of their new arrival medical evaluation.[10] These findings are consistent with the findings of the current study.

Anemia may result from a wide range of disease processes. Common causes of anemia in refugee populations include iron deficiency, inherited hematologic abnormalities (e.g., thalassemias, hemoglobinopathies, and enzyme defects), and infectious diseases (e.g., malaria and intestinal parasitosis). The ultimate cause is often multifactorial.[11]

Iron-deficiency anemia, probably the most common cause of anemia in immigrant populations, is usually manifested as a microcytic anemia. The groups most commonly affected are children and women;[12] however, refugees of both sexes and all age groups are at risk. Although it is frequently

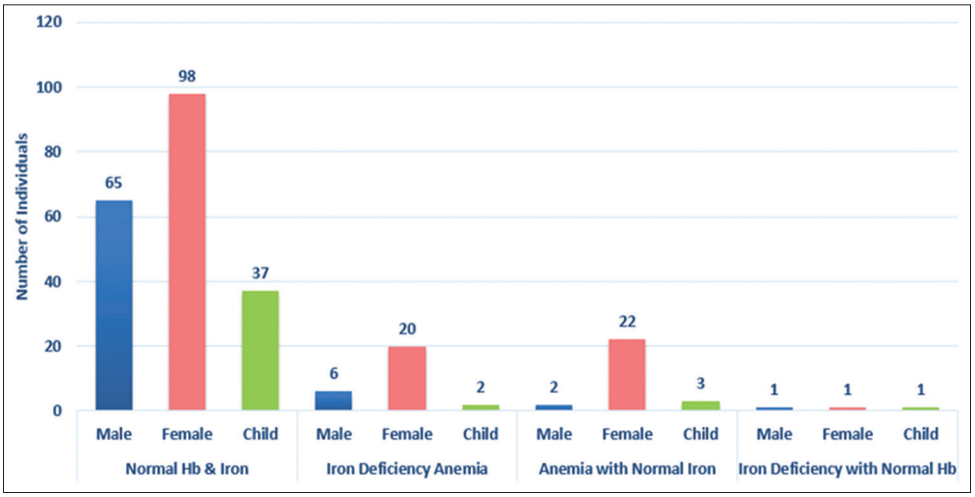

Figure 2: Correlation between iron and hemoglobin levels in refugees in Kawergosk camp in Erbil Governorate

Table 3: Mean serum levels of IgE in refugees in Kawergosk camp in Erbil Governorate

Immunological parameter	Gender	No.	Mean±SE	No.	Mean±SE	*t*-test	*P*
			Refuges		(C.G)	*P* value	
IgE IU/ml	M	121	281.97±44.81	30	34.33±6.48	0.000	H.S**
	F	137	317.59±47.29	30	33.32±6.38	0.000	H.S**

P: Probability; $P \geq 0.05$: Non-significant; $*P < 0.05$: Significant; $**P < 0.01$: Highly significant. SE: Standard error

multifactorial, it is primarily caused by deficient dietary iron. Chronic blood loss, which frequently adds to iron deficiency, is commonly caused by infection with intestinal parasites, particularly hookworm. *Helicobacter pylori* infections may lead to gastrointestinal blood loss through ulcer formation.[6]

IgE, named in 1968,[13-15] was the last of the five classes of human antibodies to be discovered, and today is commonly associated with the various manifestations of allergic disease.[16]

IgE antibodies are well known for their role in mediating allergic reactions, and their powerful effector functions activated through binding to Fc receptors FcεRI and FcεRII/CD23.[17] The possible exposure of the refugees to different allergens may be the main reason of the significant increase in IgE levels; this could also be the reason for the asthmatic sings in these individuals.[17]

One might predict that the high IgE levels which present in parasite-endemic regions would be associated with increased rates of atopic disease. However, the data on this point are complicated. A number of studies have pointed to the opposite effect, namely a decrease in allergic conditions in parasitized patients.[18,19] In the setting of chronic filarial infestation, this has been associated mechanistically with an IL-10-driven state of T_H1 and T_H2 suppression. In contrast, investigations in *Ascaris* or *Toxocara* species-infected patients point to a parasite-induced increase in allergen-specific T_H2 responses and allergic symptoms, including wheezing.[20-22] Cross-reactivity between parasitic antigens and allergens might play a significant role, as has been suggested by the observation that IgE formed in response to the tropomyosin of *Ascaris lumbricoides* recognizes the homologous proteins from the dust mite or cockroach.[23]

CONCLUSION

Mean serum levels of IgE among male and female refugees showed highly significant increasing. Most of the refugees had normal iron levels, while some had iron deficiency in which the majority were female. In addition, Hb concentrations were normal among most of them. However, anemia was found. It was revealed that there was a highly significant rising in eosinophils in male and female. WBC count is non-significantly slightly increased in both male's and female's refugees.

Recommendations

Follow-up tests or refugees are recommended to avoid any health complications and to ensure the treatment for them.

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