

A COMPARATIVE STUDY OF PHYSIOLOGICAL AND PHYSICAL PARAMETERS BETWEEN MARRIED FEMALES RESIDING AT THE QUSHTAPA REFUGEE CAMP AND IN THE CITY OF ERBIL IN KURDISTAN-IRAQ

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Refugees are under a high-risk factor of being suffering from many different diseases due to the uncontrolled accommodations environment of the camps. This study aimed to test whether the camp's habitat affecting the physical activities of the married females as a biomarker of the adverse effects on the health management issues. 60 married females (30 refugees and 30 city residents) were recruited. Blood samples of all participants were analyzed for blood glucose, blood triglycerides, blood cholesterol, blood hemoglobin (HGb), blood hematocrite percentage (HCT %) and other physical parameters estimated like body mass index (BMI), mean arterial pressure (MAP). Additionally, participants were screened for bacterial UTIs. Refugees married females showed a significant decrease in the blood hemoglobin concentration (gm/dl) compared with the city females ($P= 0.014$) and blood hematocrite percentage (HCT %) ($P= 0.0074$) and the blood triglycerides levels were also decreased significantly ($P= 0.01$). Also, no significant differences were observed for the other parameters between refugees married females and city married females. The UTI bacterial infection in refugees married females (21, 65.6%) was significantly higher than the infection among city resident married females (11, 34.4%) ($P=0.0096$). The higher incidence percentage of UTIs were caused by Gram-negative bacteria (87.5%). The most dominant pathogen which established UTIs was *Escherichia coli* (57%). A high-stress level of camp environment and nutritional malformation may affect the refugees married females more than the city females. Therefore, it is the international community responsibility to protect and provide life-saving assistance to all refugee women and to those that have been subjected to such situations.

KEYWORDS: Refugee, Anemia Status, Biochemical Parameters, UTI, Iraq.**1. INTRODUCTION**

75-80% of the worldwide displaced people are registered to be women and children (Pavlish, 2005). It is known that the health indicators and lifestyle of the refugee populations are much poorer than the living conditions of their original place (Adler *et al.*, 2008). This could be due to the fact that there are several obstacles, such as poor accessible road and shortages in power supplies, that make the refugee camps have fewer care units than other settings (Adler *et al.*, 2008). Additionally, the continuous inflow and outflow of the refugees over a period of time had a negative impact and challenging to control the distribution of the resources such as food and water or to provide sustained care for all displaced people (Rutta *et al.*, 2008). Poor housing overcrowded conditions in refugee camps were associated with a range of symptoms and illnesses such as coughs, stomach ailments, digestive disorders, and acute respiratory tract infections (Habib *et al.*, 2006; Pollack *et al.*, 2008; Turner *et al.*, 2009). Furthermore, due to the adverse situations and ongoing stressors of the camps, such as poor-quality accommodation, water and food, refugees have a high risk of developing mental health problems (Lustig *et al.*, 2004). Also, because of experience of traumatic events and multiple and chronic adversities, refugees have a higher prevalence of psychological disorders such as post-traumatic stress disorder (Fazel *et al.*, 2009).

One crucial problem that refugees suffer from is the deficiencies in essential vitamins, minerals and calories per day. This is because of the shortages in the quality and variety

of the supplied food. This led to developing several diseases such as xerophthalmia (lack of vitamin A), anemia, scurvy (vitamin C deficiency), pellagra (niacin deficiency), and beriberi (thiamine deficiency) (Weise Prinzo & de Benoist, 2002).

Another huge public health problem that refugees suffer from is the urinary tract infections (UTIs) which contributes to the overall morbidity of females in all ages of their life (Hussein *et al.*, 2018). Significantly, refugee women experience several challenges to their health, and their lives are at more risk compared to men (Memela & Maharaj, 2016). Furthermore, refugee women appear to be at greater risk for UTIs than other women residing in the city (Samari, 2017). Numerous factors can affect refugee health, including refugee camp conditions and geographic origin, which lead to face a wide variety of acute or chronic health issues.

In UTIs, bacteria are among the common reasons for seeking medical attention in the community. The main pathogens are *Escherichia coli*, and other species of Enterobacteriaceae, such as *Proteus mirabilis* and *Klebsiella pneumoniae*. UTIs Gram-negative bacteria are isolated from 75 to 95% of these infections (Assafi *et al.*, 2015; Rafalskiy *et al.*, 2020; Polse *et al.*, 2020; Maka *et al.*, 2020). The Gram-positive bacteria associated with UTIs include *Streptococcus agalactiae*, *Enterococcus faecalis*, and *Staphylococcus aureus* (Naqid *et al.*, 2020). The aim of this study was to investigate whether the camp's habitat affecting the physiological and healthy status of the refugee and non-refugee married females in Erbil city, Kurdistan region-Iraq.

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2. METHODS

2.1 Subjects

In this comparative study, sixty adult females were randomly chosen and recruited and they were divided into two groups, 30 from Qushtapa refugee campus residents and 30 from Erbil city residents (of the year 2019). Depending on a systematic random sampling method, the selection criteria for the subjects were based on a structured form. A questionnaire was designed to collect information for the participant's ages, occupation, alcohol consumption, medicine usage, and presence or absence of symptoms of UTI. Additionally, standard laboratory tests were used for selected underlying conditions.

2.2 Inclusion Criteria

Females, who had willing to participate, in the reproductive age group (20 – 30 years) were included in the study. All participants were married and not markedly different from each other in the ages and the accommodations and settlements period.

2.3 Exclusion Criteria

Females with known urinary tract anomalies or on any antibiotic therapy or menstruation phase of the menstrual cycle were excluded from the study. All the enrolled participants were not suffering from chronic hypertension. Also, they were not exposed to any kind of radiation for one year before sampling, and they non-smokers, non-diabetic and non-pregnant.

2.4 Urine Specimen Collection, Isolation and Identification

Sterile clean bottles were used to collect a clean-catch midstream urine sample. The urine was centrifuged and the sediment was examined microscopely for the existence of pus cells, red blood cells, epithelial cells, casts, mucus and crystals, also the pH was measured. For urine culture, urine samples were inoculated, using streak plate methods, on 5% blood agar and MacConkey agar plates (Oxoid, UK) according to procedures developed by Finegold and Martin (Baron *et al.*, 1994; Cheesbrough, 2006). Then, a Gram stain was performed for the pure isolated colonies. Then, the isolates were identified using standard microbiological methods. For Gram-negative bacteria, the Analytical Profile Index (API 20E, BioMerieux, France) was used for presumptive identification, while an appropriate biochemical test was used for proper identification of Gram-positive as reported by Cheesbrough (Cheesbrough, 2006).

2.5 Blood Collection

The blood samples were collected under aseptic conditions for hematological and biochemical analysis. Capillary blood sampling, with skin punctures (finger, or heel, or ear lobe) was performed to collect the blood.

2.6 Estimation of Blood Glucose Levels

Blood glucose levels were measured using the commercial glucose strips kit of HUMAN. by Multicare-in instruments – Biochemical system international S.r.l.Via C.Ferraris,220.52100 Arezzo - Italy.

2.7 Estimation of Blood Triglycerides and Cholesterol Levels

Although blood triglycerides and cholesterol levels were measured using the commercial strips kit of HUMAN. by

Multicare-in instruments – Biochemical system international S.r.l.Via C.Ferraris,220.52100 Arezzo - Italy.

2.8 Estimation of Blood Hemoglobin Concentration and Hematocrit %

The hemoglobin concentration and hematocrit % were estimated by using the Mission Hbhemoglobin testing system – Acon laboratories, Inc.10125 Mesa Rim Road, San Diego, CA 92121, USA – the test strips obtained from the same factory.

2.9 Blood Mean Arterial Pressure and Heart Rate

Standard digital sphygmomanometer (RossMax) international Ltd Switzerland was used to measure the blood pressure for either arm, in the sitting position. Appearance and disappearance of Korotkoff sounds were analysed to record the systolic and diastolic blood pressures. After that, the mean arterial blood pressure was estimated using the equation:

$$MAP \approx P_{dias} + \frac{1}{3}(P_{sys} - P_{dias})$$

2.10 Calculation of Body Mass Index

All participants were tested for their body mass index (BMI). The ratio of body weight (using a digital balance) to height squared which expressed in kg/m² was calculated to test the BMI.

2.11 Statistical Analysis

Obtained data were analyzed and values were expressed as mean ± SD. Data were statistically analyzed using Graph pad software. The mean±SE was analysed using the Student's T-test for independent samples. Results were analyzed using a two-sided significance level of p< 0.05.

2.12 Ethics Statement

This study and method protocol of attaining consent was approved by the scientific committee of the department of basic sciences, Hawler Medical University/ College of Dentistry, Kurdistan, Iraq.

3. RESULTS

Thirty refugee camps married females residents, mean ages ± S.E (24.77 ± 0.61), and thirty Erbil city married residents females, mean ages ± S.E (25.41 ± 0.90), were participated. The rate of UTI in selected women who lived in the camps was 70% (21/30), which was higher than women who lived in the city (37%) (11/30).

In general, 32 bacterial isolates were identified among all participants. The UTI bacterial infection among camp residence (21, 65.6%) was higher than the infection among city people (11, 34.4% city), and this difference was statistically significant (P=0.0096). Additionally, the higher percentage of UTIs were caused by Gram-negative bacteria (87.5%) compared by Gram-positive (12.5%) Table 1.

Table 1. Distribution of the isolates according to the residency of the patients

Isolates	Number of isolates/Camps	Number of isolates/Control (city)	N (%)
Gram negative	19	9	28 (87.5)
Gram positive	2	2	4 (12.5)
Total	21	11	32 (100)

In this study, 57% of the females with UTIs suffered from *Escherichia coli* followed by 17% from Klebsiella spp, 7% from Staph aureus, and 2% from Pseudomonas spp. The results can be found in table 2.

Table 2. Prevalence of UTI bacterial infection among patients

No.	Bacterial isolates	Number of isolates/ Camps	Number of isolates/ Control (City)	N (%)
1	<i>Escherichia coli</i>	11	6	17 (53)
2	<i>Klebsiella spp</i>	7	3	10 (31.3)
3	<i>Staphylococcus aureus</i>	2	2	4 (12.5)
4	<i>Pseudomonas spp</i>	1	0	1(3.1)
	Total Bacterial isolates	21	11	32 (100)

Among the 21 refugee women that had a UTI, the urine pH was acidic in 14 patients and alkaline among 7 patients. While, among the 11 control females (city residence) with UTI, the urine pH was acidic in 4 patients and alkaline among seven patients (Table 3).

Table 3. pH of the urine

No.	pH of the urine	Camps females	Control (city) females
1	Acidic	14/21	4/11
2	Alkaline	7/21	7/11

Table 4, figures 1 and 2 show the statistical evaluations between camp married females and city married females. The data in this study reveals that in camp married females group, they showed a significant decrease in the hematocrit percentage (HCT %) compared with the city females group at the level of ($P=0.0074$). While blood hemoglobin concentration (gm /dl) were also significantly decreased in camp married females group compared with the city females group at the level of ($P=0.0144$). Finally, no significant differences were observed for the other parameters between camp married females and city married females groups.

Table 4. The statistical evaluations between camp married females and Erbil city females residents all data were expressed as (mean ± S.E).

Parameters	City females		Camp females		t(60)	P
	M_1	SE_1	M_2	SE_2		
BMI (Kg/M ²)	26.25	1.06	26.69	1.22	0.25	0.80
MAP (mm.Hg)	92.14	2.93	96.13	2.63	0.99	0.32
HCT (%)	37.82	0.81	34.73	0.70	2.81**	0.00
Hemoglobin Hb (gm /dl)	12.78	0.27	11.81	0.25	2.57*	0.01
Blood triglycerides (mg/dl)	87.29	10.88	127.2	16.66	1.80*	0.01
Blood cholesterol (mg/dl)	151.8	8.32	149.5	7.01	0.20	0.88
Random blood sugar (mg/dl)	101.5	5.36	100.5	3.90	0.15	0.87
Age (years)	25.41	0.90	24.77	0.61	0.60	0.54

Note: M_1 =Mean for group 1 (City females); SE_1 =SE for group 1 (City females); M_2 =Mean for group 2 (Camp females); SE_2 =SE for group 2 (Camp females).
* = t-value significant at 0.01 p level.

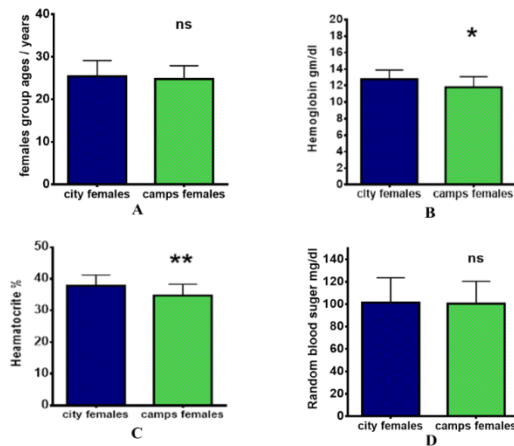


Figure 1. The statistical analysis between camp married females and city married females. A, the age groups (years). B, the hemoglobin concentration (gm /dl). C, the hematocrit percentage (HCT %). D, the random blood sugar levels (mg/dl). ns: not significant.

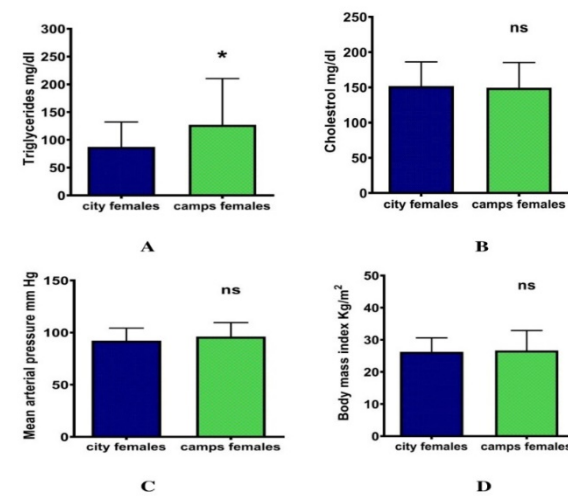


Figure 2. The statistical analysis between camp married females and city married females. A, blood triglycerides levels (mg/dl). B, blood total cholesterol levels (mg/dl). C, the mean arterial pressure (mmHg). D, the body mass index (Kg /m2). ns: not significant.

4. DISCUSSION

Concerning the residence of the women, the current study showed that a significant association was found between women’s UTIs and their residency. The highest proportion of UTIs was found among women who lived in camps, 70% in camps versus 37% in Erbil city. The possible risk factors, such as the nature of camp sanitation, personal hygiene, education level, can be attributed to the incidence of UTIs (Hurrell et al., 2004). The emergence of this high percentage of UTIs among women residing camps may be due to the weakness of defence that creates a good opportunity for UTIs. Generally, vitamins, macronutrient and micronutrient deficiencies can be resulted from the poor nutrition. One possible reason for immunodeficiency could be due to the phagocytosis and complement cascade (main mechanisms for eradication infectious agents from the body). This can lead to weakness to fight infection and to increase the susceptibility to pathogens (Keusch, 2003; Saeed et al., 2016).

Although it is a simple test, urinalysis is considering one of the valuable tools to detect serious diseases in the early stages, including kidney problems and UTIs. In the present study, culture positivity was observed to be directly proportional to the existence of a large number of pus cell, epithelial cells, mucus and RBCs indicating UTIs (Habib et al., 2006; Dey et al., 2017). Interestingly, it has been observed that most of the urine pH taken

from refugees' women were acidic. Research performed at Washington University School of Medicine surprisingly showed that the acidic pH of urine was supported the growth of bacteria by preventing the activity of a protein called siderocalin, which assists the host to overcome the pathogens by depriving them of iron (Shields-Cutler *et al.*, 2015).

Compared to non-refugees, resettling refugee women may be at greater risk than women refugees for several infections, including UTIs that need a multiplicity of health interventions. In women, UTIs are known to be one of the common bacterial infections, often as recurrent disease. Here, it was shown that the most causative agent for infection among women in both Qushtapa camps and Erbil city was *Escherichia coli*, followed by *Klebsiella pneumoniae* and *Staphylococcus aureus*. Several studies have been consistent with the current study, for example, a study that included ten years of clinical isolates from patients with UTI in Lebanon showed that UTIs were mostly associated with Gram-negative bacteria and *E. coli* was the dominant causative agent followed by *Klebsiella pneumoniae*. This could be as a reason for the specific structures in Gram-negative bacteria which enables adherence to the uroepithelial cell (Khatri *et al.*, 2012) and their ability to adhere to the wall of the urinary mucosa using a type of fimbrial adhesin called P fimbriae (Bien *et al.*, 2012; Jahandeh *et al.*, 2015).

Gram-positive cocci contributed fewer UTIs than Gram-negative (Khatri *et al.*, 2012). In our study, the only Gram-positive bacteria was *Staphylococcus aureus* from women who lived in camp and Erbil city. A similar frequency of isolates of Gram-positive has been obtained from various studies (Farajnia *et al.*, 2009; Elmanama *et al.*, 2018; Ayelign *et al.*, 2018).

Refugees' life is associated with new stressful challenges. To be able to manage these challenges, we assumed that the married females who they jobless and remain in that environment more than singles females and the males under the high-risk factor from suffering the adverse health effects on the physical and psychological status. The most important problems are beginning with malnutrition and poor sleep habits. This could lead to several mental as well as physiological consequences. The camps in Kurdistan continued to accommodate Syrian refugees. A total of 2.8 million refugees had required protection in the region in April 2014. Among the seven camps in Kurdistan, Iraq, the highest number of consultations were in Domiz camp, which recorded 24,248 consultations. Consultations were also reported from Arabat (5,170), Basirma (10,607), Darashakran (15,155), Gawilan (6,727), Kawergosk (13,160), and Qushtapa (4,736) camps. A total of 79,813 consultations were reported in Kurdistan. In Kurdistan, Iraq, the highest health utilization rate (HUR) was observed in Basirma (13.8) while the lowest in Domiz (1.9) consultations per person (UNHCR, 2014).

Until now, no clear report was submitted by the human affairs organizations about the anemia disease in the mentioned above camps of Kurdistan. In this study, a high frequency of anemia was observed from the data for the married refugee's females, which may be returned to a shortage in resources and the main causes of anemia are dietary iron deficiency (IDA). This high occurrence of anemia shed light on the fact that anemia is a serious public health problem that required attention. It was revealed that the overall prevalence of anemia among Ethiopian was 41.9%, which was in agreement with the finding of the current study (Ogbeide *et al.*, 1994).

With aspect to that anemia is one of the most public nutritional issues in the world today. In this study, it was observed that anemia was the major issue in the Qushtapa

camp. Many reasons could lead to iron deficiency anemia. One important step toward preventing and treatment of anemia are the accurate identifying of the cause of IDA. Six possible causes were identified as a reason for the IDA among women of reproductive age. These were including; age, disease and hygiene, food intake, malnutrition, and supplementation (WHO, 2004).

Three groups of food can be identified. The first group that can be consumed by an absolute majority of women (such as cereal, vegetable, lentils, fats, tea, and coffee). The second group of food can be consumed by fewer (such as dairy products, other fruits, and meat) and the final group was consumed by the absolute minority (such as liver and egg). Several studies revealed that meat, liver, fish, and fruit had a positive impact on anemia among women of reproductive age (Hurrell *et al.*, 2004; Tetens *et al.*, 2007).

In this study, besides the anemia status that found significantly in the married women who resident in Qushtapa camp, the blood triglycerides level was higher than what we obtained in the city females, but unfortunately due to the restriction of the sample size and high degrees of the standard error, the result should be reconsidered with more studies using larger sample size to confirm and approve the achieved result of the high triglycerides level.

5. CONCLUSIONS

Studying life habitat like refugees (camp living) stress will always be a part of daily living for all females worldwide. The new challenge in the refugee's life had a negative impact on their physiological and psychological development. Therefore, it is the social responsibility to protect all displaced women and those that have been subjected to such situations. During their resettlement in recipient countries, all refugees, irrespective of sex, have significant needs. Women's gendered experiences both before and after a flight from areas of global conflict, as well as stressors faced in exile, resulting in needs that are distinct from those of refugee men. Physical violence is more common among refugee women and mental health issues, as well as the fact that women are more vulnerable to sexual assaults and abuse by armed forces, fleeing is often more difficult for them than it is for men. The experiences of refugee women include vulnerability to abuse, as well as special physical, emotional, and social needs, as well as a variety of health-related issues. More research is needed to assess how well women's health after a flight is linked to how well their children are feeling, adapting, and performing. Furthermore, lower socioeconomic status and language barriers make the resettlement process especially difficult for women. This can limit their access to education and job opportunities. We recommend manual healthcare services and studies, as well as access to cultural, social, material, and resilience factors that help female refugees adjust and adapt around the world. Reuniting refugee families is critical because distance can have a negative impact on mental health after arrival. In all other countries with refugee females, including Kurdistan, studies and jobs should be a priority that can be achieved to be independent financially.

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