J Immigrant Minority Health
DOI 10.1007/s10903-014-0127-3

ORIGINAL PAPER

Pre- and Post-displacement Stressors and Body Weight Development in Iraqi Refugees in Michigan

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Abstract Refugees have typically experienced stress and trauma before entering the US. Stressors and mental health disorders may contribute to obesity. The aim of this study was to investigate changes in the body mass index (BMI) in Iraqi refugees settled in Michigan in relationship to pre- and post-migration stressors and mental health. Anthropometric and demographic data were collected from 290 Iraqi refugees immediately after they arrived in Michigan and one year after settlement. Significant increases were observed in BMI ($+0.46 \pm 0.09$ kg/m^2, $p < 0.0001$) and the percentage of refugees suffering from hypertension (from 9.6 to 13.1 %, $p < 0.05$). Significant increases in stress, depression and acculturation, as well as decreases in post-migration trauma and social support, were also observed. Linear regression analyses failed to link stressors, well-being, and mental health to changes in BMI. It is likely that acculturation to a new lifestyle, including dietary patterns and physical activity levels, may have contributed to these changes.

Keywords Iraqi refugees · Body mass index · Lifestyle · Acculturation · Nutrition · Mental health

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Introduction

Numerous studies indicate a high rate of mental and behavioral health disorders in refugees [1–4]. There is also a rapidly increasing body of research reporting that refugees have increased risk for the development of chronic somatic disorders, including metabolic syndrome, hypertension, cardiovascular disease, and diabetes [5]. However, displaced refugees not only suffer from prior and ongoing trauma, but may also acculturate into a less healthy lifestyle in their new countries, including nutritional habits with implications for both somatic and mental health [5, 6]. Refugee research to date has paid little or no attention to the possible psychological and somatic implications of these changes in lifestyle, especially in relationship to refugees' mental health and past and current exposures to trauma and stressors.

While medical examinations are provided to refugees, the detection and effective treatment of mental health problems lag far behind. In addition, mental health problems are often more complex in refugees, due in part to language and cultural barriers and biases and to sociodemographic and/or resettlement issues [7]. Common mental health diagnoses in refugees include post-traumatic stress disorder (PTSD), depression, and anxiety [8]. Many refugees from Iraq have lived through war and suffered a long period of violence and human rights violations [9–12]. Furthermore, these refugees have often experienced psychosocial trauma and socioeconomic stressors for a long period of time during displacement [8, 13]. Not surprisingly, Iraqi refugees who resettle in the US suffer from a high rate of mental health symptoms. In a recent study, the majority of refugees reported intense anxiety and depression, and many met the DSM-IV criteria for posttraumatic stress disorder. They also exhibited a higher incidence of

Published online: 07 November 2014

PTSD (28.4 %) and depression (22.4 %) compared to the general population [9].

There are very limited data about the prevalence of diabetes and obesity in Iraqi refugees in the US. Nevertheless, extremely high rates of diabetes and pre-diabetes have been observed in adult Arab Americans in Michigan, home to the largest population of Iraqi refugees in the US [14]. The combined rates of glucose intolerance were 32.3 % for women and 49.8 % for men [15]. Chronic diseases such as diabetes and obesity are rising globally and many Iraqi refugees arrive in the US with already pre-existing chronic conditions. Previous studies indicate that Iraqi refugees are generally older and thus more likely to suffer from chronic illnesses [16]. It is important to address the literature gap and the need for better documentation of the prevalence of diabetes and obesity in Michigan-based Iraqi refugees in order to provide much-needed data for the future development of community-based intervention programs to promote refugee health. Thus, the purpose of this study was to examine the impact of socio-demographic, mental health conditions and physical characteristics on body mass index (BMI) changes over time in Iraqi refugees who have resettled in Michigan.

Methods

Participants

Two hundred and ninety-eight refugees were recruited to participate in this descriptive study shortly after they arrived in the US. Recruitment of refugees was primarily conducted through our community partners Lutheran Social Services of Michigan (LSSM), Kurdish Human Rights Watch, Inc. (KHRW), and Catholic Services of Macomb (CSM), the main agencies in Michigan for refugee resettlement services. Most refugees in Michigan are registered with LSSM, KHRW and CSM. Upon arrival to the United States, they must apply for institutionally provided services (financial, housing, etc.) and attend orientations at one of the LSSM locations. In order to facilitate recruitment of study subjects, LSSM regularly supplied the research team with lists of all eligible recent refugees, who agreed to be contacted by the research team to receive further information about the study. From these lists, a computer randomly selected 35 % of the sample. Selected individuals were contacted via telephone to schedule interviews; 98 % chose to participate. Each participant received a gift certificate to a local store in the amount of $35.00 after each completed survey that took 2–3 h to complete. All procedures and materials were approved by the Institutional Review Board of Wayne State University (Protocol #: 025509B3F).

At the end of one year, data was collected from 290 refugees, a retention rate of 97.3 %. Of these 290 individuals who completed both baseline and one-year data collections, 137 (46 %) were female and 161 (54 %) were male. The mean age at baseline was 33.4 ± 11.3 years old (ranging between 18–69) and approximately half of the sample was married (154, 51.7 %). Eighty-five (28.5 %) individuals had tertiary qualifications, and the remaining reported a high school education or less. Two hundred forty-eight refugees (83.2 %) identified as Christian. At the baseline assessment, the participant had been in the US an average of 1.0 ± 1.1 month.

Measurements

Anthropometric data, such as weight and height, were collected to calculate BMI. The participants received the survey questionnaires in Arabic and English; each question had been translated into Arabic and translated back by a second bilingual person to confirm the acceptability of the translation. All questionnaires were administered in a structured interview procedure in which the interviewer read the questions to the participants and recorded their answers.

The surveys included questions from different standardized instruments. The demographic questions were adopted from the National Health Interview Survey, 2006 (NHIS, CDC 2006). For drinking and smoking questions, a "yes" or "no" answer was recorded. The questions about chronic diseases were self-reported as "yes" or "no" based on whether they had been assigned one of more such diagnosis form their primary health care provider. The PTSD assessment was the 17-item PTSD Checklist (PCL) [17]. This questionnaire has excellent test–retest reliability, ranging from 0.96 after 2–3 days to 0.88 after one week [18], and validity, ranging from 0.85 to 0.93 [17]. The depression score was based on the 7-item depression subscale of the Hospital Anxiety and Depression Scale (HADS; [19]). The reliability of HADS ranges from 0.67 to 0.90 [20]. Wagnild and Young's 25-item Resilience Scale [21] was used to estimate the resilience. The reliability of this measurement ranges from 0.72 to 0.94 [21]. The acculturation score was obtained from an adapted Arab Acculturation Scale (AAS) [22]. All 8 items in the AAS scale was used; 4 for separation/assimilation and 4 for integration/marginalization, were included. The original AAS used a 7-point Likert scale. However, a 5-point Likert scale was used in the current study in order to reduce ambiguity among the choices. There was no prior reliability data for the 5-point Likert scale. In the current study, the Cronbach's alphas for both assessments were 0.72. Social support was measured by questions that reflected support from family and friends. These items

were scored on a 5-point Likert scale, ranging from *strongly agree* to *strongly disagree*. Stress was assessed using a 5-point Likert scale ranging from 1 (*not at all*) to 5 (*extremely*).

Statistical Analysis

Body mass index was calculated based on participant-reported body weight and height [BMI = body weight (kg)/height $(m)^2$]. Change in BMI between baseline and year one was evaluated by paired *t* test. Non-parametric statistics (Chi square) were used to analyze and compare smoking, drinking and disease status between baseline and one year. Mental health status was calculated by combining deviation scores of trauma, depression and PTSD scores after subtracting the respective means from each score [Mental health score = (individual trauma score − mean trauma score) + (individual depression score − mean depression score) + (individual PTSD score − mean PTSD score)] to prevent variables with high values (trauma and PTSD) from masking the low value variable (depression) and biasing the composite score.

A 5-model linear regression was used to identify potential predictors of changes in BMI. In model 1, BMI was predicted by 3 demographic variables: age, gender and education. In model 2, obesity (underweight/healthy vs overweight/obese) and diabetes categories (yes or no) were entered as potential predictors. Trauma and stress scores were added in model 3. To further expand the potential predicting variables, depression and PTSD scores were added to the regression analysis in model 4. In model 5, resilience and social support scores were entered into the regression. All statistical analyses were performed using IBM SPSS version 22 (IBM Corp., Armonk, NY). The significance level was set to a two-tailed $p < 0.05$.

Results

General Health

At the time refugees entered the US, 145 (48.7 %) had been diagnosed with one of the following chronic diseases: hypertension, heart disease, diabetes and overweight/obesity. In addition, 28 (9.4 %) suffered from 2 chronic diseases, 6 (2 %), from 3 diseases, and 1 (0.3 %) suffered from all 4 diseases.

Body Weight

The mean BMI at baseline and at the end of one year were in the overweight range. At the time of the refugees' arrival in the US, the overweight and obese rates were 38.3 and 19.3 % respectively. After one year in the US, BMI had increased significantly ($p < 0.0001$, Table 1). Overweight and obesity rates were 38.3 and 21.7 %, respectively. The underweight rate decreased from 6.2 to 3.8 %. The BMI distribution at baseline and year 1 is depicted in Fig. 1. There was a significant upward shift toward higher BMI ($p < 0.0001$). For those who were underweight at baseline, 44.4 % gained weight and moved to the healthy BMI range. For those who had healthy weight at baseline, 1 % became underweight and 18 % became overweight, but none became obese. Of the overweight individuals (111), 10.8 % lost weight and reached a healthy weight and 11.7 % gained enough weight to move to the obese category. Of the obese participants (56), 10.7 % decreased their weight to the overweight range while the remaining 89.3 % remained in the obese range.

Female refugees had a significantly higher increase in BMI than males (0.80 ± 0.13 and 0.18 ± 0.11 kg/m^2, respectively, $p < 0.0001$).

BMI changes were divided into quartiles. The lowest 25 % (n = 72) had a mean BMI change of -1.47 ± 0.10 kg/m^2 while the highest 25 % (n = 76) had a BMI change of 2.27 ± 0.08 kg/m^2. The middle 50 % (n = 141) had a BMI change of 0.47 ± 0.05 kg/m^2. All of the changes were significantly different from each other ($p < 0.0001$). There were no significant differences in any of the studied psychological and mental health variables between the top and bottom 25 % groups.

Smoking Status

The percent of smokers increased significantly from 26.3 % at baseline to 28.9 % ($p < 0.05$) after one year in the US. Among participants who were smoking at the end of one year, the increase in BMI tended to be lower than those who did not smoke (0.23 ± 0.11 vs 0.56 ± 0.11 kg/m^2, $p = 0.09$). The refugees who were initially non-smokers but became smokers in the US (n = 22) tended to have lower BMI changes (0.02 ± 0.31 vs 0.61 ± 0.11 kg/m^2, $p = 0.088$) and less trauma (-12.4 ± 0.56 vs -10.5 ± 0.23, $p = 0.008$) but higher PTSD scores (2.64 ± 1.63 vs -0.01 ± 0.44, $p = 0.063$) compared to those who remained non-smokers.

Drinking

There was a significant increase in the percentage of participants who consumed alcohol during the first year (from 20.1 % at baseline to 37.3 % at the end of one year, $p < 0.0001$). According to their BMI changes, all drinkers at the end of year one tended to gain less weight than non-drinkers (0.27 ± 0.14 vs 0.58 ± 0.11 kg/m^2 respectively, $p = 0.085$). Non-drinkers, who started drinking during the

Table 1 Differences between baseline and year 1

	Baseline	1 year	Changes	*p*
BMI	26.40 ± 0.28	26.87 ± 0.28	0.46 ± 0.09	<0.0001
Smoking	74 (26.1 %)	81 (28.5 %)	2.4 %	<0.05
Drinking	57 (20.1 %)	106 (37.3 %)	17.3 %	<0.0001
Hypertension	28 (9.6 %)	38 (13.1 %)	3.5 %	<0.05
Heart disease	10 (3.4 %)	10 (3.4 %)	0	=1.00
Type 2 diabetes	12 (4.5 %)	17 (5.8 %)	1.3 %	=0.14
Current stress	1.19 ± 0.03	1.75 ± 0.06	0.56 ± 0.06	<0.0001
Discrimination	3.11 ± 0.06	3.02 ± 0.01	−0.09 ± 0.06	=0.13
Acculturation	16.83 ± 0.12	17.51 ± 0.18	0.68 ± 0.18	<0.0001
Depression	1.85 ± 0.20	3.42 ± 0.25	1.57 ± 0.23	<0.0001
PTSD	19.47 ± 0.32	19.61 ± 0.34	0.14 ± 0.36	=0.70
Trauma	12.57 ± 0.20	1.42 ± 0.05	−11.1 ± 0.21	<0.0001
Social support	19.73 ± 0.13	19.11 ± 0.15	−0.62 ± 0.16	<0.0001
Resilience	30.88 ± 0.19	30.63 ± 0.19	−0.24 ± 0.23	=0.29
Mental health	−0.16 ± 8.84	−0.07 ± 9.30	−0.10 ± 0.57	=0.86

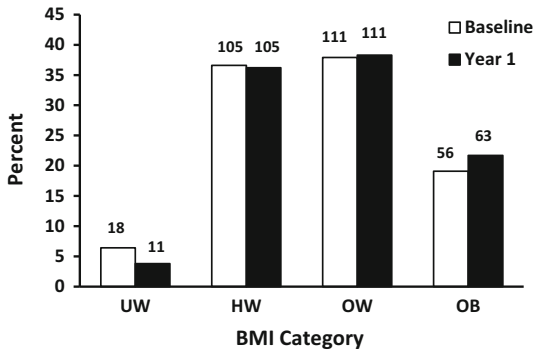

Fig. 1 Percent of participants according to BMI distribution at baseline and the end of one year. The number above each bar represents the number of participants in each BMI category. A significant upward trend was observed ($p < 0.0001$). *UW* underweight, BMI < 19.9 kg/m^2, *HW* healthy weight, 20.0 < BMI < 24.9 kg/m^2, *OW* overweight, 25.0 < BMI < 29.9 kg/m^2, *OB* obese, BMI > 30.0 kg/m^2

first year, had significantly lower trauma scores as compared to continuous non-drinkers (−12.0 ± 0.44 vs 10.8 ± 0.26, $p < 0.05$), higher social support (0.14 ± 0.32 vs −0.84 ± 0.21, $p < 0.05$), higher resilience (1.12 ± 0.4 vs −0.63 ± 0.32, $p < 0.01$) and improved mental health condition (−2.1 ± 1.2 vs 1.05 ± 0.76, $p < 0.05$). There were no differences in BMI changes over the first year between the two groups.

Hypertension

Ninety percent of the refugees were normotensive at baseline. Of the 28 hypertensive persons, 27 remained hypertensive after one year. There was a significant increase in the number of participants (11, 4.2 %) who developed hypertension during the first year ($p < 0.05$). Newly diagnosed hypertensive individuals increased their depression ($p < 0.05$) and anxiety ($p < 0.05$) scores, and lowered their resilience scores ($p < 0.01$) compared to baseline levels, as well as to those who remained normotensive during the first year. No gender difference was observed.

Heart Disease

Two hundred and eighty-one participants had no heart disease at baseline. After one year, 5 (1.8 %) had developed heart disease. Of the 10 who had heart disease at baseline, 5 (50 %) reported that they no longer had heart disease after one year. There were no significant changes in the number of male and female participants with heart disease at the end of year 1 compared to baseline.

Diabetes

At baseline, 278 of the refugees reported they did not have diabetes. After one year, 7 (2.5 %) had developed diabetes. Three out of the 13 diabetics at baseline reported that they were no longer diabetic after one year. There was no significant change in the number of refugees with diabetes during the first year. A trend of increased diabetes prevalence in females was observed (from 5 to 9, $p = 0.055$) but not in males. At the end of one year, those who developed diabetes were more likely to score higher on depression ($p < 0.01$), PTSD ($p < 0.0001$), trauma ($p < 0.05$), anxiety ($p < 0.01$) and mental health issues ($p < 0.05$), and to score lower in social support ($p < 0.005$) and resilience ($p < 0.005$) compared to those who were still diabetes-free.

Table 2 Linear regression predicting *changes* in BMI during year 1

Variable	R^2	ΔR^2	B	SE B	β	*p*
Model 1	0.05	0.04				=0.003
Gender			−0.62	0.17	−0.21	<0.0001
Age			−0.01	0.01	−0.07	=0.226
Education			0.04	0.19	0.01	=0.846
Model 2	0.09	0.08				<0.0001
Gender			−0.65	0.17	−0.22	<0.0001
Age			−0.02	0.01	−0.12	=0.045
Education			0.09	0.19	0.03	=0.640
Diabetes (year 2)			−0.25	0.37	−0.04	=0.506
Obesity (year 2)			0.68	0.18	0.22	<0.0001
Model 3	0.09	0.07				<0.0001
Gender			−0.66	0.18	−0.22	<0.0001
Age			−0.02	0.01	−0.12	=0.052
Education			0.11	0.19	0.03	=0.574
Diabetes (year 2)			−0.26	0.39	−0.04	=0.509
Obesity (year 2)			0.66	0.19	0.21	<0.0001
Trauma change			0.01	0.03	0.24	=0.697
Stress change			−0.02	0.09	−0.01	=0.845
Model 4	0.09	0.06				=0.002
Gender			−0.66	0.18	−0.22	<0.0001
Age			−0.02	0.01	−0.12	=0.054
Education			0.11	0.19	0.03	=0.584
Diabetes (year 2)			−0.25	0.40	−0.04	=0.537
Obesity (year 2)			0.66	0.19	0.22	<0.0001
Trauma change			0.01	0.03	0.02	=0.702
Stress change			−0.01	0.10	−0.01	=0.894
Depress change			0.01	0.03	0.03	=0.729
PTSD change			−0.01	0.02	−0.04	=0.57
Model 5	0.10	0.06				=0.004
Gender			−0.66	0.19	−3.56	<0.0001
Age			−0.02	0.01	−0.12	=0.06
Education			0.11	0.20	0.03	=0.57
Diabetes			−0.28	0.40	−0.04	=0.49
Obesity			0.66	0.19	0.21	=0.001
Trauma change			0.01	0.03	0.02	=0.783
Stress change			−0.28	0.10	−0.02	=0.773
Depress change			0.01	0.03	0.01	=0.857
TPSD change			−0.01	0.02	−0.04	=0.617
Resilience change			0.01	0.03	0.02	=0.724
Social support change			−0.03	0.04	−0.06	=0.356

B unstandardized beta, *SE B* standard error for beta, *β* standardized beta

Mental Health

A significant increase in stress levels and depression were observed during the first year (Table 1, p's < 0.0001). No changes in perceived discrimination and PTSD. There was no change in resilience, a defense mechanism against mental health disorders, either. Aggregate trauma scores for the first year in the US were significantly lower than pre-migration trauma scores ($p < 0.0001$). Social support scores decreased, but acculturation scores increased during the first year (p's < 0.0001).

There was no change in overall mental health after one year. However, a significant gender discrepancy emerged: females' mental health scores worsened (1.84 ± 0.88, $p < 0.05$) while males tended to improve (-1.34 ± 0.72, $p = 0.066$) compared to their baseline status. The difference between males and females was significant ($p < 0.01$).

In order to identify factors that predicted BMI at the baseline and at the end of year one, as well as BMI changes during the first year, a 5-model linear regression analysis was conducted. Three demographic variables: age, gender and education were introduced in the model first, followed by obesity and diabetes categories. Trauma and stress were added in model 3; depression and PTSD scores were added in model 4; and resilience and social support scores were entered into model 5. Baseline age and gender (p's < 0.0001) predicted BMI. At the end of one year, only age ($p < 0.0001$) contributed to BMI. As for the changes in BMI during the first year (Table 2), gender was the most significant contributor ($p < 0.0001$), followed by age in all 5 models. No other factors contributed to changes in BMI. When data was stratified by gender, a different picture emerged. For female participants, age, diabetes and BMI category contributed significantly to BMI change. For males, only BMI category predicted BMI change during the first year.

Discussion

This study examined the anthropometrical and psychological characteristics of Iraqi refugees immediately after they arrived in the US and one year after arrival. These refugees typically experienced trauma, depression, and other psychological stressors before relocation ([8] for review). After relocation, with the drastic changes in cultural and physical environment, many refugees may experience a new set of hardships with accompanying psychological and physical stressors. Therefore, it is imperative and critical to document their physical and psychological conditions immediately after resettlement and changes in these parameters in the initial period of displacement, since refugees likely face immediate cultural and environmental stressors that have potentially adverse effects on physical and psychological well-being. One previous study reported that the most common chronic diseases in Iraqi refugees

settled in Jordan is hypertension (22 %), followed by visual disturbances (12 %), joint disease (11 %) and type 2 diabetes (11 %) [23]. In our study, 9.7 % of the Iraqi refugees had already been diagnosed with hypertension when they entered the US, 3.4 % had heart disease, and 4.7 % had type 2 diabetes. These are all lower rates than those reported in Jordan. These data indicate that the refugees who settle in Jordan may have different backgrounds than those who settle in the US. It also raises the possibility of a "healthy refugee" effect—that is, only refuges in relatively good health are able to combat all of the obstacles to achieving refugee status and strong enough to relocate to the US as compared to those who settled in Jordan [24]. No changes in the incidence of chronic diseases, except hypertension, were observed during their first year in the US. Nevertheless, refugees who developed chronic diseases were more likely to experience more stress, depression, PTSD, and lower social support than those who remained disease-free.

A significant increase in BMI and an upward shift in the distribution across BMI categories were observed among the refugees during their first year in the US. Detailed review of the data shows that more refugees became obese and fewer remained or became underweight during their first year in the US. As reported earlier, previous studies have indicated that the Arab population in Michigan has an even higher prevalence of overweight and obesity (52.2 and 28.5 %, respectively) than that observed in our study sample (38.3 and 21.7 % at the end of one year, respectively) [25]. Thus, as more Iraqi refugees settle in the US, education about maintaining a healthy lifestyle and body weight should be a top public health priority.

Change in BMI during the first year was best predicted by gender and, to a lesser degree, age. Psychological stress is known to induce weight gain [26]. However, in the current study, significant changes in BMI were not associated with changes in psychological factors, nor mental health, suggesting that other factors may be responsible for these changes. Body weight gain is a result of energy intake exceeding energy expenditure. The BMI changes could be due to changes in food consumption patterns, resulting in increased food and caloric intake. Designing a dietary intake questionnaire, one that is culturally appropriate and takes into consideration the food items commonly consumed by Iraqis, is urgently needed in order to obtain dietary intake patterns and changes as these refugees become more acclimatized to Western society. In addition, the validated International Physical Activity Questionnaire Arabic version (IPAQ-Arabic, https://sites.google.com/site/theipaq/questionnaire_links), a telephone questionnaire [27], could be a valuable tool to assess physical activity levels over time in these refugees. Studies using such measures are needed to better delineate the causal factors that contribute to an unwanted increase in BMI in this population.

In the current study, a substantial numbers of refugees developed type 2 diabetes during the first year. These refugees showed more psychological and mental symptoms and less resilience and lower social support when compared to those who did not develop diabetes. Such findings support an association between diabetes and mental health, as suggested by Black [28], and highlight the urgent need for mental health intervention that integrates somatic health into the care process of Iraqi refugees, perhaps other refugee groups as well. It is important to note that female refugees gained significantly more weight than males did. Females were also more likely to develop diabetes and to experience declining mental health, while male refugees showed an improvement. All of these significant changes occurred already within the first year, indicating that these health conditions could result in more significant and profound health damage over time. This highlights the need for an effective intervention in the early stages of refugee displacement. Since obesity is one of the risk factors for type 2 diabetes [29], and Michigan Arabs have high rates of diabetes and pre-diabetes [15], culturally sensitive strategies to prevent weight gain are needed to reduce the risk of diabetes in Arabic refugees, especially women.

There was a significant increase in the number of refugees who reported drinking alcohol from baseline to the end of their first year in the US. These individuals experienced less trauma, higher social support and resilience, and improved mental health. Further study to determine the causal relationships among these parameters may help ease the refugees' transition into a new life. At the same time, strategies to prevent future alcoholism should not be ignored.

Five refugees no longer reported heart disease symptoms and three of the 13 diabetics reported being diabetes-free after one year in the US. Since the baseline disease status was based on diagnoses obtained in Iraq, different diagnostic criteria in Iraq and the US may have produced this remarkable reversal of heart disease and diabetes status in these individuals. The incidence of hypertension increased during the first year and was associated with higher depression and anxiety scores and lower resilience scores. Further investigation is needed to determine whether blood pressure will gradually decrease once refugees become more acclimated to their new society.

Limitations

First, as the majority of the participants were Christians, the findings may not be generalizable to other Arab refugees. Future studies to recruit more Muslim participants are

warranted. Second, the disease states were self-reported. Though the criteria for studied chronic diseases are similar in the US and in Iraq, having American physicians provide all diagnoses will likely improve the accuracy of disease status in future studies. Third, no dietary data was collected from participants; the study's primary conclusion is therefore somewhat speculative. Even though the contributions of psychological and mental health conditions to the increase in BMI were not confirmed, dietary intake data are urgently needed in order to ascertain its contribution to the BMI increase, as well as the possible relationship between dietary habits and mental health in this population.

Conclusion

In this study, we followed a newly arrived group of Iraqi refugees for one year. There were significant changes in psychological parameters as well as BMI. However, neither psychological parameters nor mental health conditions predicted changes in BMI, although they were associated with the development of diabetes. Therefore, it is speculated that acculturation to a new lifestyle, including dietary patterns and physical activity levels, play a role in increasing BMI during the first year in the US. It is therefore suggested that future studies follow refugees overtime and more in details assesses the relationship between possible changes in dietary habits and lifestyle as it relates to the acculturation process and long-term health and wellbeing. This would contribute to a better understanding of reasons behind the observed changes in body weight and chronic diseases. These data may shape strategies to prevent obesity and chronic diseases in refugees, such as developing nutritional education programs and providing easy access to exercise facilities, in order to promote healthy lifestyles. These data may also guide policies to establish healthy environments for refugees in general.

Acknowledgments The study was supported by a grant from the National Institute of Mental Health (NIMH, award number R01MH085793). Drs. Arnetz and Jamil are also partially supported by a grant from the National Institute of Environmental Health Sciences (P30ES020957). The content is solely the responsibility of the authors and does not necessarily represent the official views of NIMH.

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