

Rapid Weight Gain in Pediatric Refugees after US Immigration

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What is already known about this subject?

Studies of adult immigrants show that living in the United States for at least 10 years is associated with significant increases in BMI. No large studies exist examining weight trajectory in newly arrived pediatric refugees.

What does this study add?

Pediatric refugees have a weight gain velocity that exceeds non-refugee immigrants.

Abstract

Objective

Prior studies of immigrants to the United States show significant weight gain after 10 years of US residence. Pediatric refugees are a vulnerable population whose post-immigration weight trajectory has not been studied.

Methods

We examined the longitudinal weight trajectory of 1067 pediatric refugees seen in a single university based refugee health program between the dates of 9/3/12 – 9/3/14 to determine how quickly significant weight gain occurs post-arrival. The most recent BMI was abstracted from the electronic health record and charts reviewed to obtain serial BMI measurements in 3 year increments after the date of US arrival.

Results

The mean arrival BMI percentile for all refugees was 47th percentile. This increased significantly to the 63rd percentile within 3 years of US arrival ($p < .01$). This rapid increase was largely attributable to African and South & Southeast Asian refugees. The overall prevalence of age & sex adjusted obesity rose from 7.4% at arrival to 18.3% within 9 years of US immigration exceeding the pediatric US national obesity prevalence of 16.9%.

Conclusions

Pediatric refugees are at increased risk of rapid weight gain after US immigration. Targeted interventions focused on prevention of weight gain in specific populations are warranted.

Manuscript

Introduction

The 2011 – 2012 National Health and Nutrition Examination Survey (NHANES) estimates that 16.9% of United States pediatric patients aged 2 – 19 are overweight.¹ Studies of adult immigrants show that living in the United States for at least 10 years is associated with significant increases in BMI.² In a study of 6421 adult immigrants, Roshania *et al.* found that immigrants with younger age at arrival (<20y) are more likely to be overweight or obese with increasing duration of US residence than immigrants who arrived at older ages.³ Of 15 studies cited in a recent literature review of the relationship between immigrant duration of US residence and body weight, only a single study included children.⁴ In 2013, a total of 69,909 refugees were admitted to the United States through the US Refugee Admissions Program (USRAP). 34% of these refugees were under 18 years of age.⁵ There are no large longitudinal studies examining post-resettlement weight gain in pediatric refugees. We hypothesize that pediatric refugee populations are at higher risk for rapid onset of weight gain after immigration to the US than typical immigrant populations.

Methods

We electronically abstracted the most recent BMI measurements for all current and former patients seen in the Pediatric International Health Clinic at SUNY Upstate Medical University between 9/3/12 – 9/3/14. Charts were reviewed from the time of most recent measurement to the date of US arrival. Serial heights and weights were recorded in 3-year increments to create a longitudinal database to calculate BMI trajectory. Patients

were excluded from the study if their age at arrival was <2 years or if they had a chronic medical condition affecting normal growth. All pediatric refugees undergo an intake evaluation within 90 days of US arrival and these initial measurements were designated as their baseline arrival height & weight. Age and sex-adjusted BMI Z-scores were calculated using the Centers for Disease Control and Prevention (CDC) Epi Info 7.1.5 for all measurements of children 2-19 years old.⁶ For members of the study population with measurements beyond 20 years of age we used the recommended age-20 BMI z-score calculation to maintain a continuous variable and consistent measurement of weight across time.⁷ Epi Info excludes outlying data and extreme changes in BMI Z scores >2 were verified with the medical record. For categorical determinations of prevalence, obesity was defined as BMI \geq 95th percentile for age 2-19 years, and BMI \geq 30 for age \geq 20 years. Overweight was defined as BMI \geq 85 – <95th percentile for age 2-19 years, and BMI 25 – <30 for age \geq 20 years.^{8,9} Refugees were categorized into 4 regions of origin (Africa, South & Southeast Asia, Middle East, and Europe). Data analyses were performed with SPSS (version 22) and included descriptive statistics (means and proportions) and inference-based statistics (95% confidence intervals). Linear mixed models were fitted to account for the repeated measurements of BMI z-scores across time, with control for age, sex, region of origin, and duration of US residence. These z-scores were then converted back to BMI percentile for ease of interpretation. The study was reviewed and approved by the SUNY Upstate Medical University's Institutional Review Board.

Results

Table 1 shows the median age of pediatric refugees at the time of their arrival visit was 8 years (range, 2-19 years). The majority of the 1067 pediatric refugees in our study originated from Africa (62%), followed by the Middle East (17%), South & Southeast Asia (16%), and Europe (5%). 48% were female. The mean duration of US residence at the time of last measurement was 3.6 years (SD – 3.5y) with European refugees living in the US the longest (10.1 years). The median age at the time of final weight measurement was 13 years (range 2-24). The average number of serial weight measurements of study participants was 2.4 (SD – 1.2).

Table 2 presents the adjusted mean BMI percentile for pediatric refugees by duration of US residence and region of origin. The overall mean BMI percentile of refugees upon arrival was 47th percentile. This increased significantly to 63rd percentile within 3 years of US arrival ($p < .01$). This rapid increase is largely attributable to African and South & Southeast Asian refugees. European refugees saw significant increases in mean BMI percentile to the 68th percentile within 6 years of US resettlement. In contrast, Middle Eastern refugees arrived with a higher mean BMI percentile (71st percentile) than other pediatric refugees and maintained this elevated weight post-immigration.

The figure shows the prevalence of overweight and obese status stratified by duration of US residence. The overall prevalence of obesity at arrival for pediatric refugees was 7.4%. This rose to 18.3% within 9 years post-resettlement, exceeding the US obesity prevalence of 16.9%. The prevalence trajectory for overweight status in our study was

similar, with pediatric refugees nearly matching the US overweight prevalence of 31.8% within 9 years of US immigration.¹ The observed decline in overweight & obese prevalence seen after 9 years is partially attributable to the lack of refugees from the region with the heaviest weight burden, the Middle East.

Discussion

This study is the first to demonstrate rapid development of weight gain among pediatric refugees following resettlement in the United States. Our data indicate that the velocity of weight gain exceeds previously published studies of non-refugee immigrants who typically require at least 10 years of US residence for significant increases in BMI.² Some of the initial weight gain is likely secondary to catch up growth with improved access to nutrition. However, weight gain continued to increase significantly throughout our study and the prevalence of obesity exceeded the US prevalence of 16.9% within 9 years post immigration. Numerous adverse health outcomes are associated with obesity including increased healthcare utilization, and up to 80% of overweight adolescents will become obese adults.^{10,11} Identification and mitigation of this weight gain is critical to providing these new Americans the opportunity for a healthy, productive life.

The observed rapid weight gain may have several possible causes. Pediatric refugees who arrive at a younger age may be more likely to adopt an unhealthy American diet and gain weight rapidly.³ Children in poverty are more likely to become overweight or obese and this likely contributes to the conditions that promote rapid weight gain for newly arrived

refugees.¹² Prior experience with food insecurity also increases the likelihood of being overweight or obese.¹³

In contrast to previous cross-sectional studies that utilize self-report data,⁴ we report serial data obtained by direct measurement of refugee heights & weights from a single center, enhancing the reliability of our data. Our study has some limitations. BMI measurements do not accurately predict adiposity in all cases, especially in intermediate BMI categories and for black, non-Hispanic children who make up a significant portion of our study.¹⁴ Current CDC BMI Z-score data were obtained from a standardized sample of Americans,⁹ which may not be appropriate for children of all races or from all regions of the world. However, BMI is a widely used measurement that is easily interpreted by the medical community and consistently reported in the literature.

Our work provides data supporting targeted interventions for obesity prevention in specific refugee populations after US arrival. Determining what strategies are most effective in preventing rapid weight gain in these populations requires further study.

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Table 1. Demographic Data of Refugee Patients (n=1067)

Region	N (%)	% Female	Median (range) age at arrival*	Mean (SD) duration of US residence*	Median (range) age at final measurement*	Mean number (SD) of serial BMI measurements
Africa	667 (62)	49	8 (2-19)	3.6 (3.4)	13 (2-23)	2.4 (1.2)
South & Southeast Asia	171 (16)	46	9 (2-18)	3.9 (2.5)	14 (3-23)	2.5 (1.0)
Middle East	180 (17)	46	10 (2-18)	1.7 (1.8)	11 (2-21)	1.8 (0.8)
Europe	49 (5)	55	5 (2-18)	10.1 (4.3)	18 (3-24)	4.0 (1.4)
Overall	1067 (100)	48	8 (2-19)	3.6 (3.5)	13 (2-24)	2.4 (1.2)

*Number of years

Table 2. Adjusted mean BMI percentile (95%CI) by duration of US residence and region of origin^a

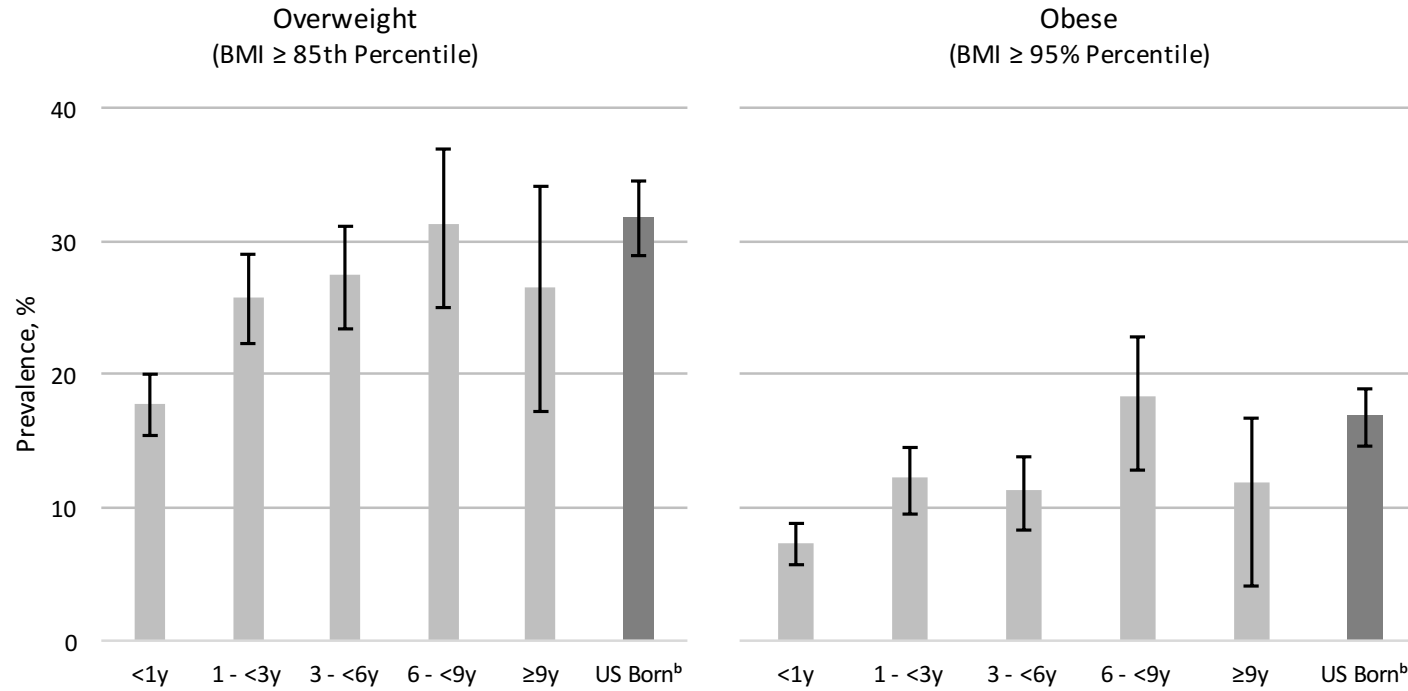
	Africa	South & Southeast Asia ^b	Europe	Middle East ^b	Overall
<1y	36 (32 – 40)	41 (34 – 48)	41 (28 – 55)	71 (64 – 76)	47 (42 – 51)
1 to <3y	56 (52 – 60) ^c	57 (50 – 64) ^c	49 (36 – 62)	78 (72 – 83) ^c	63 (59 – 67) ^c
3 to <6y	64 (59 – 68) ^c	62 (54 – 69) ^c	68 (56 – 78) ^c	78 (69 – 85)	70 (66 – 74) ^c
6 to <9y	71 (65 – 77) ^c	68 (56 – 78) ^c	70 (57 – 81) ^c	82 (64 – 93)	75 (70 – 80) ^c
≥9y	75 (66 – 83) ^c		82 (65 – 93) ^c		79 (72 – 84) ^c

^aRegion of origin columns are adjusted for age, sex and duration of residence. The overall column is adjusted for these factors plus region of origin.

^bCells with <5 observations are blank.

^cSignificant increase in mean percentile BMI over arrival (<1y) measurement. (All *P* values < .01).

Figure. Overweight and Obesity prevalences by years of US residence (n=1067)^a



^aError bars represent 95% confidence interval

^bUS born 2 - 19y overweight & obese prevalences are provided for comparison¹