Pediatric Refugees in Rhode Island: Increases in BMI Percentile, Overweight, and Obesity following Resettlement

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ABSTRACT

OBJECTIVE: To evaluate BMI change among pediatric refugees resettling in Providence, RI.

METHODS: Retrospective chart review of pediatric refugees from the initial evaluation to year 3 post-resettlement at Hasbro Children's Hospital. Primary outcome of interest was within person change in BMI percentile at each time point.

RESULTS: From 2007–2012, 181 children visited the clinic. Initial prevalence of overweight and obesity was 14.1% and 3.2% versus 22.8% and 12.6% at year 3. From visit 1 and years 1–3, there was a positive mean within person change in BMI percentile of 12.9% (95% CI 6.3–19.6%s), 16.6% (95% CI 11.2–21.9%), and 14.4% (95% CI 9.1–19.7%).

CONCLUSIONS: The prevalence of overweight and obesity increased from 17.3% at initial intake to 35.4% at 3 years post-resettlement to surpass that of American children (31.7–31.8% for 2007–2012). Refugee children have additional risk factors for obesity; multidisciplinary interventions must be designed to address nutrition at each visit.

KEYWORDS: refugee, pediatric, child, obesity, overweight, BMI, weight

BACKGROUND

Refugees arriving in the United States (US) present with health problems that differ drastically from those of the general population. Research from across the US shows high rates of positive purified protein derivative testing for latent TB,[1-3] elevated lead levels,[4] pathogenic gastrointestinal parasites,[2,3,5] anemia, malnutrition, dental carries, and mental health problems in this at-risk population.[1-3, 5,6] However, little evidence is available regarding the changing medical needs of pediatric refugees over time and whether their needs ultimately mirror those of American-born children.

Pediatric obesity remains a problem of critical importance in the US, with rates having doubled to tripled over the last 25 years. Almost 17% of children and adolescents ages 2–19 currently meet criteria for obesity (body mass index (BMI) > 95th percentile for age and sex) and nearly one-third of American children are either overweight (BMI between 85th to <95th percentile) or obese.[7-9] In Rhode Island (RI), 16.3% of children ages 2–5 and 16.7% of adolescents are overweight while 15.5% and 10.4% are obese, respectively.[10] The health effects of obesity in childhood include both short-term effects (type II diabetes,[11] hypertension, dyslipidemia,[12] orthopedic problems,[13] and even poor quality of life[14]) as well as longer-term risks (obesity in adulthood, cardiovascular disease,[12] diabetes, and some cancers[15,16]).

While there are countless research efforts targeted at understanding obesity and its outcomes in both the pediatric and adult populations in the US, there is little research that specifically focuses on obesity amongst refugee populations and even less is available regarding pediatric refugees. Several research studies have shown that among different adult immigrant subgroups, the number of years of residence in the US is associated with higher BMI after 15 years.[17,18] A smaller study of 69 Somali refugee children in 2009 noted that refugee children who were overweight or at risk for becoming overweight on arrival were more likely to be overweight on follow-up at 24 months than children who were not at risk or overweight on arrival,[19] but more research is needed.

RI welcomed 1,010 refugees between 2007 and 2012, the majority of whom resettled from Burundi, Iraq, Eritrea, Liberia, Nepal, Bhutan, Myanmar, Somalia, and the Democratic Republic of Congo. Of these, 181 were children evaluated at the Pediatric Refugee Health Program (PRHP) at Hasbro Children's Hospital in Providence between October 2007 and March 2012. Working under the Federal Refugee Act of 1980 and in collaboration with the Dorcas International Institute of RI (the state's primary refugee resettlement agency), this program coordinates the care of newly-resettled pediatric refugees and provides ongoing primary care after the initial evaluation. The refugee intake process, including timing of initial appointments, screening labs, and immunization process has been described elsewhere.[20-22] In conjunction with refugee interpreters working as community health workers, the pediatric clinic involves additional ancillary services including: intake dental assessment, mental health follow-up, and frequent contact with schools.

METHODS

We conducted a retrospective chart review of all refugee patients who underwent initial evaluation at the PRHP

during the above-specified date range (n=181). The time frame and sample size were selected out of convenience given concomitant quality improvement initiatives at the clinic aimed to enhance the comprehensive care services offered to refugees. Inclusion criteria were: at least two annual well-child checks (WCC) and age between 2 and 18 years.

Data was collected from the initial intake appointment as well as all annual WCCs and included background information (i.e. age, sex, country of origin, country of exit, birthplace, language, etc), and physical exam and lab results (i.e. height, weight, body mass index (BMI), BMI percentile, blood pressure, results from screening labs, etc). BMI was determined by calculating weight in kilograms divided by height in meters squared. BMI percentile was calculated based on the Centers for Disease Control (CDC) BMI for age and sex growth algorithms. Overweight and obese were defined according to the CDC and as written above. Both BMI and BMI percentile were included in analysis only when calculated at WCC visits to reduce selection bias based on more frequent visits for obesity follow-up. A WCC visit was counted in a given follow-up "window" if it occurred within the first week following arrival as well as during subsequent intervals thereafter (i.e. 1–12 months for year 1 post-resettlement, 13–24 months for year 2, and 25–36 months for year 3). This study was approved by the Lifespan Institutional Review Board.

The primary outcome of interest was within person change in BMI percentile from the time of initial visit to each subsequent year following. Using JUMP software version 8.0, ninety-five percent confidence intervals (95% CI) were derived for the mean within person change in BMI percentile from initial intake to 1, 2, and 3 years post-resettlement to assess whether there was a significant positive increase in BMI percentile over time. This was defined as having mean change in BMI over time with 95% confidence intervals that did not include zero. This is somewhat analogous to use of a P-value of $P < 0.05$ but is more informative as it provides the range of values around the mean to be expected. We further stratified these analyses based on the presence of underweight at time of arrival (BMI percentile for age and gender <3%) versus those who were not underweight, as these subjects might be expected to have a more significant increase in BMI which would represent a healthy process. Finally, we examined the overall prevalence of overweight and obesity in this population at arrival and each year following.

RESULTS

Of the 181 children who visited the PRHP for intake between 2007 and 2012, 103 (57%) were male and 78 (43%) were female. They emigrated from 17 different countries across the continents of Africa and Asia. Of the 181 children for whom data was available, 156 (86.2%) met the above inclusion criteria.

Demographic characteristics of the subjects at their initial visit and at each year of follow-up are displayed in **Table 1**. Data was available for 43 (27.5%), 76 (48.7%), and 79 (48.7%) children at years 1, 2, and 3. Across all years, the majority of participants were boys. While the age distribution of participants was approximately equal between ages 2-15 at the initial visit, subsequent visits demonstrate an increase in the number of participants aged 5-10. Approximately 5.7% of subjects were underweight at arrival. The majority of subjects were from the African continent, with Burundi and Eritrea most heavily represented; among those participants who emigrated from the Asian continent, Iraq and Nepal were most heavily represented. Though the individual breakdown between the 17 represented countries varied by year, the majority of participants who followed up remained those from African nations by year 3 post-resettlement.

Figure 1 demonstrates that the baseline prevalence of overweight and obese rose from 14.1% and 3.2% at initial intake to 22.8% and 12.7% at year 3, respectively. Overall,

Table 1. Baseline and Follow-up Characteristics of Pediatric Refugees Attending the Pediatric Refugee Health Program at Hasbro Children's Hospital, 2007-2012

	Initial visit (n = 156)	Year 1 (n = 43)	Year 2 (n = 76)	Year 3 (n = 79)
Number of months post-resettlement at follow-up, mean (SD)	N/A	11.1 (2.4)	17.2 (3.8)	30.1 (3.4)
Male sex, n (%)	103 (58.3)	25 (58.1)	44 (57.9)	49 (62.0)
Age (years), n (%)				
2 to <5	48 (30.8)	12 (27.9)	21 (27.6)	15 (19.0)
5 to <10	39 (25.0)	16 (37.2)	27 (35.5)	28 (35.4)
10 to <15	47 (30.1)	9 (20.9)	17 (22.4)	23 (29.1)
15+	22 (14.1)	6 (14.0)	11 (14.5)	13 (16.5)
Percentage underweight (BMI% <3)	5.7	0	1.3	1.2
Family continent of ethnic origin, n (%)				
Africa	90 (57.7)	26 (60.5)	39 (51.3)	45 (57.0)
Asia	64 (41.0)	17 (39.5)	37 (48.7)	34 (43.0)
Not listed	2 (1.3)	N/A	N/A	N/A
BMI percentile, mean (95% CI)	49.4 (44.4-54.2)	68.5 (60.7-76.3)	57.8 (50.9-64.8)	64.0 (57.4-70.6)

N/A, not applicable; SD, standard deviation; BMI, body mass index; CI, confidence interval

the total prevalence of overweight or obesity more than doubled from 17.3% initially to 35.4% by year 3, with the most substantial increase occurring by year 1 post-resettlement. Between the initial visit and the year 3 post-resettlement WCC, the mean BMI percentile rose from 49.4% to 64.0% among all participants. To put these results within the context of an individual subject and minimize bias in loss to follow-up, we calculated the mean within person change in BMI percentile between the initial visit and each subsequent year as shown in **Table 2**. Between the initial visit and year 1 post-resettlement, there was a positive mean within person BMI percentile change of 12.9% (95% CI 6.3–19.6%). Similarly, between the initial visit and the years 2 and 3 WCCs, there were positive mean within person changes of 16.6% (95% CI 11.2–21.9%) and 14.4% (95% CI 9.1–19.7%), respectively. We then stratified the within person change analyses by presence of underweight initially and found that even among those who were not underweight at arrival, there remained a significant positive change in BMI percentile for age and gender, with means and CI as follows from arrival to years 1–3: 12.9% (95% CI 6.3, 19.6%), 14.8 (95% CI 9.4–20.2%) and 14.2 (95% CI 8.8, 19.7%).

Figure 1. Prevalence of Overweight and Obese Among Refugees Attending the Pediatric Refugee Health Program at Hasbro Children's Hospital, 2007-2012

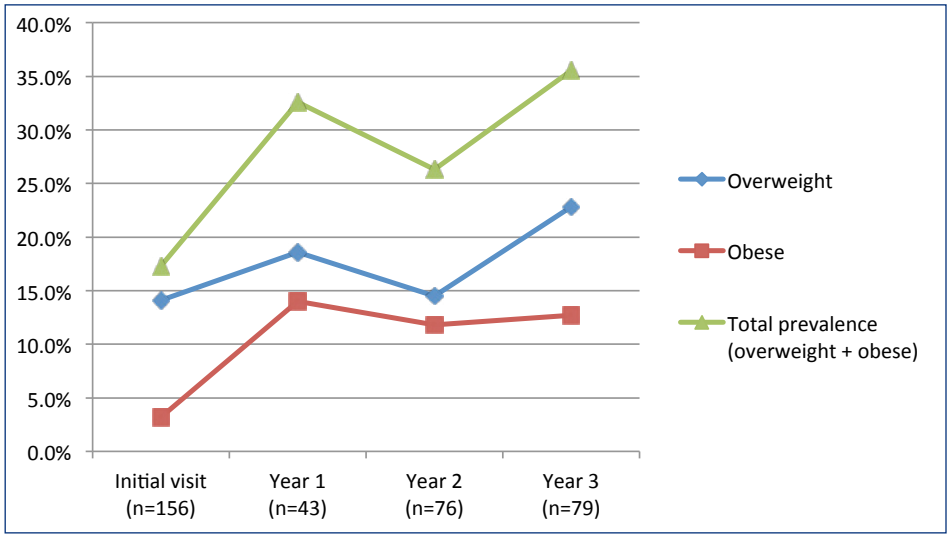

Table 2. Mean Within Person Change in BMI Percentile at Years 1–3 Post-Resettlement

	Years post-resettlement		
	Year 1	Year 2	Year 3
Mean within person change			
BMI percentile (entire cohort)	12.9 (6.3–19.6)	16.6 (11.2–21.9)	14.4 (9.1–19.7)
BMI percentile (underweight excluded)	No change	14.8 (9.4–20.2)	14.2 (8.8–19.7)

DISCUSSION

Although refugee children resettling in the US do not initially have the same prevalence of overweight and obesity as do American-born children (17.3% in our study vs 31.7–31.8% based on National Health and Nutrition Examination Survey (NHANES) data for children aged 2–19 from 2007–2012[7-9]), we observed a significant increase in prevalence to approximate that of American-born children within 1 year post-resettlement (32.5%) and to surpass that of American-born children within 3 years post-resettlement (35.4%). Results on our primary endpoint also confirm a significant positive mean within person increase in BMI percentile at years 1-3. This was true even after excluding children underweight at arrival. Our results, which confirm that length of stay in the US is associated with increased BMI percentile, mirror those published about adult immigrant populations[17,18] and one small study involving refugee children.[19]

Many factors predispose refugees to gain weight upon moving from areas of relative food shortage to the US. Biochemically, prenatal nutrient restriction has been shown to predispose to obesity later in life during times of food abundance.[23] Children born in resource-constrained settings who are at higher risk of low birth weight may be at increased risk of obesity once they move to the US. Cost, availability, transportation, and other barriers to procuring nutritious foods, as well as developing a taste preference for American foods, have also been theorized to lead to unhealthy eating habits.[24] Aside from just changes in diet, refugee children may be more physically inactive once moving to the US, and other socioeconomic and cultural factors (including parents having less time to prepare meals, unsafe neighborhoods lending to sedentary lifestyles, trauma related to the migration process, and degradation in social position) are additional obstacles.[24,25]

This study has several potential limitations. First, we observed substantial loss-to-follow-up among this population, especially within the first year post-resettlement. This may reflect the fact that once in the US there is significant secondary migration for employment or to join family members in a more established anchor community. The increase in lost-to-follow-up at year 1 may also reflect the unfamiliarity of refugees to primary health care services in this country. Interventions must address the importance of keeping families within their patient-centered medical

home (PCMH) during this transition utilizing trained community health workers.

Furthermore, our results were limited by the accuracy of the data we abstracted from the charts. Many refugees immigrating to the US do not have documented birth certificates or do not know their exact dates of birth; upon entering the US, many are automatically assigned a January 1st birthday of the year they are believed to have been born. Since our calculations were predicated on having accurate ages so that BMI percentile could be correctly calculated, it is possible that these results either over or underestimate the actual prevalence of overweight or obese within this population. The primary endpoint of mean within person change addresses this issue.

This study confirms that refugee children are at risk of becoming overweight and obese within the first year following resettlement and that their risk increases by the third year post-resettlement. Given these trends, in addition to the extensive workup done at intake to address infectious diseases and mental health conditions, focused interventions should be designed to counsel these at-risk families on nutrition at every visit. These interventions should firmly root resettling refugee families within their PCMH by integrating ethnically-, culturally-, and linguistically-appropriate counseling by nutritionists, nurse care managers, physicians and most importantly, community health workers, who can guide and educate providers as to the cultural context of food for a particular culture or individual families. Further research is still needed to better define the problem of pediatric obesity among refugee populations, including following a larger number of participants over a longer period of time as well as evaluating interventions designed to help this at-risk population.

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