



Assessment of Growth in Pediatric Syrian Refugee Populations in Jordan

Amanda Vakos^{1,2,*} Nadia Khalil^{3,*} Ambuj Kumar⁴ Lynette Menezes⁴ Minal Ahson⁵

¹Morsani College of Medicine, University of South Florida, Tampa, Florida, United States

²Department of Obstetrics and Gynecology, West Penn Hospital/Allegheny Health Network, Pittsburgh, Pennsylvania, United States

³Department of Neurology, Morsani College of Medicine, University of South Florida, Tampa, Florida, United States

⁴Department of Internal Medicine, Morsani College of Medicine, University of South Florida, Tampa, Florida, United States

⁵Department of Internal Medicine, Department of Pediatrics Morsani College of Medicine, University of South Florida, Tampa, Florida, United States

Address for correspondence Amanda Vakos, MD, 4800 Friendship Ave, Pittsburgh, PA 15224, United States (e-mail: amanda.vakos@ahn.org).

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Abstract

Background Externally displaced pediatric Syrian refugees are at risk of adverse developmental health outcomes in the setting of food insecurity. To evaluate the impact of displacement on nutritional status of Syrian children, this study describes the prevalence of malnutrition of Syrian children residing in Jordan.

Methods A retrospective cross-sectional analysis of data from patient records < 18 years of age from the Syrian American Medical Society's (SAMS) January 2019 mission trip to Jordan was performed. Prevalence of stunting, severe wasting, wasting, overweight, and underweight were calculated using the World Health Organization (WHO) definitions.

Results Overall, 392 Syrian children were included. In the 0 to 59 months group ($n = 191$), prevalence of stunting was 13.9% ($n = 165$), severe wasting 4.2% ($n = 165$), wasting 6% ($n = 165$), overweight 16.4% ($n = 165$), and underweight 5.3% ($n = 190$). In the > 59 months group ($n = 201$), prevalence of stunting was 7.2% ($n = 194$), severe wasting 3.6% ($n = 194$), wasting 5.2% ($n = 194$), overweight 6.7% ($n = 194$), and underweight 4.6% ($n = 153$). Age group was significantly associated with stunting (odds ratio [OR] = 2.08, 95% CI 1.03 to 4.19) and overweight (OR = 2.72; 95% CI 1.36 to 5.47) with increased odds of each in the 0–59 months group.

Conclusion The findings suggest evidence of higher prevalence of malnutrition in Syrian children compared with prior assessments and greater impact on the younger cohort. In 0 to 59 months' old Syrian children, stunting and wasting were of medium severity and overweight was of high severity. This may reflect food insecurity in the setting of ongoing conflict, strain on resources, and evolving refugee policies, acknowledging study limitations. Syrian refugee children living in Jordan experience wasting and stunting. Comprehensive assessment of current nutritional status of Syrian children is needed. Access to adequate and nutritious food is paramount.

Keywords

- ▶ global health
- ▶ pediatrics
- ▶ growth
- ▶ nutrition
- ▶ syrian refugee crisis
- ▶ syrian refugees

* These authors contributed equally to the manuscript (co-first authors).

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Introduction

The Syrian refugee crisis encompasses the political, social, and economic turmoil and concomitant violence, injustice, and instability since the outbreak of civil war in 2011.¹ As of March 2019, there were 5,689,127 externally displaced Syrian refugees, 45% of which are children.² Despite governmental and international efforts, refugees face limited access to basic resources, including food insecurity and reduced food diversity, posing substantial risk for adverse developmental health outcomes in pediatric populations.^{3–8}

To evaluate the impact of displacement on nutritional status of Syrian children, this study describes the prevalence of acute malnutrition, stunting, and overweight among Syria children residing in Jordan.

Materials and Methods

The data used in this analysis were extracted and provided by members of the Syrian American Medical Society (SAMS) through retrospective review of patient charts from the January 2019 mission trip to Jordan. The study was approved by University of South Florida's Institutional Review Board, protocol number 00039351.

Inclusion/Exclusion

Syrian children < 18 years of age between January 19 and 24, 2019, living in Jordan and seen by a pediatrician at one of six locations, including Mafraq, Maa'daba, Irbid, Saltt, Nuzha, and Marka, were eligible for inclusion. Children seen by general practitioners were excluded due to lack of logistics to collect anthropometric data. Additionally, children may have been included more than once, as data were collected over a 6-day period in which there were no measures in place to account for repeat visits.

Data Abstraction

Data was abstracted from all eligible subjects and included age in months, sex, weight, and height. Age was determined by birthdate on United Nations High Commissioner for Refugees (UNHCR) registration card; if unavailable, birthdate was provided by parent or another accompanying guardian, and if exact birthdate was unknown, guardians provided estimated age. Weight was measured by Smart Weight DVS digital scale without removal of clothes given cold weather. Length was measured by tape measure in the standing or recumbent position, which can result in a difference of approximately 0.7 cm.⁹ All data were collected and recorded by SAMS volunteer physicians and nurse practitioners.

For patients between 0 to 59 months of age, BMI and z scores were generated using the World Health Organization (WHO) Analyser.¹⁰ For patients > 59 months of age, body mass index (BMI) and z scores were generated using the WHO AnthroPlus calculator.¹¹

Measurements for severe wasting, wasting, underweight, overweight, and stunting were calculated according to the WHO definitions. Severe wasting is defined as weight-for-height < three standard deviations (SD) below the norm.

Wasting is defined as weight-for-height < two SD below the norm. Underweight defined as weight-for-age < two SD below the norm. Overweight is defined as weight-for-height > two SD above the norm. Stunting is defined as height-for-age < two SD below the norm.¹²

We compared the prevalence of wasting, stunting, and overweight in our study to the WHO prevalence thresholds stipulated in a study published by Onis et al to determine severity of malnutrition in Syrian refugee children < 18 years seen at SAMS clinics in Jordan.¹³

Descriptive statistics were used to summarize subject characteristics where continuous variables were summarized as medians with ranges and categorical variables as rates. The association between the outcome variable (e.g., stunting, overweight, etc.) and the predictor variable (e.g., age group) was assessed using binary logistic regression and summarized as odds ratio (OR) along with 95% confidence intervals (CI). The statistical significance was set at 5% for all comparisons. All data analyses were performed using SPSS version 25 statistical analysis software.¹⁴

Results

Overall, 392 subjects met inclusion criteria. Of the 392 subjects included in this study, 191 (49%) were 0 to 59 months of age and 201 (51%) were > 59 months of age.

In 0 to 59-months age group, the median age was 24 months (range 0.79–59 months); 48% ($n=92$) were male, 51% ($n=98$) were female, and 1% ($n=1$) data for sex was missing. Prevalence of severe wasting, wasting, underweight, overweight, and stunting is reported in [Table 1](#). Notably, length was missing for 26 participants.

In the > 59 months age group, the median age was 96 months (range 60–213 months); 54% were male ($n=108$) and 46% ($n=93$) were female. Prevalence of severe wasting, wasting, underweight, overweight, and stunting is reported in [Table 1](#). Notably, length was missing for 7 subjects of this group. Additionally, underweight was unable to be calculated for those more than 120 months of age, which were 42 subjects out of the 201 > 59 months.

As shown in [Table 2](#), overall, age group was significantly associated with stunting (OR 2.08; 95% CI 1.03 to 4.19; $p=0.04$) and overweight (OR 2.72; 95% CI 1.36 to 5.47; $p=0.005$), where OR refers to ratio of the odds of the event in the 0 to 59 months age group to the odds of the event in the > 59 months age group. Age group was not significantly associated with severe wasting (OR 1.18; 95% CI 0.41 to 3.45; $p=0.757$), wasting (OR 1.18; 95% CI 0.48 to 2.93 $p=0.709$), or underweight (OR 1.15 95% CI 0.43 to 3.12; $p=0.77$).

Discussion

The WHO defines prevalence thresholds for stunting, wasting, and overweight for children < 5 years for the purpose of global monitoring of malnutrition. The aim is for all countries to achieve “low” or “very-low” levels, and for governments and aid organizations to trigger action and target programs when prevalence thresholds are above these levels. This

Table 1 Prevalence of severe wasting ^a, wasting ^b, underweight ^c, overweight ^d, and stunting ^e, in the 0 to 59 months and > 59 months age groups

| Variable | Event/total ^f | Proportion | Simple z 95% confidence intervals | |
|--------------------------|--------------------------|------------|-----------------------------------|-------------|
| | | | Lower limit | Upper limit |
| Overall | | | | |
| Stunting | 37/359 | 10.30% | 7.16% | 13.45% |
| Wasting | 20/359 | 5.57% | 3.19% | 7.94% |
| Severe wasting | 14/359 | 3.89% | 1.89% | 5.90% |
| Overweight | 40/359 | 11.14% | 7.88% | 14.39% |
| Underweight ^g | 17/343 | 4.95% | 2.65% | 7.25% |
| 0–59 months | | | | |
| Stunting | 23/165 | 13.93% | 8.65% | 19.22% |
| Wasting | 10/165 | 6.06% | 2.41% | 9.70% |
| Severe wasting | 7/165 | 4.24% | 1.16% | 7.31% |
| Overweight | 27/165 | 16.36% | 10.71% | 22.00% |
| Underweight | 10/190 | 5.26% | 2.08% | 8.43% |
| > 59 months | | | | |
| Stunting | 14/194 | 7.21% | 3.57% | 10.85% |
| Wasting | 10/194 | 5.15% | 2.04% | 8.26% |
| Severe wasting | 7/194 | 3.60% | 0.98% | 6.23% |
| Overweight | 13/194 | 6.70% | 3.18% | 10.21% |
| Underweight ^g | 7/153 | 4.57% | 1.26% | 7.88% |

Abbreviations: BMI, body mass index; SD, standard deviation.

^aSevere wasting is defined as a z score-for-BMI of < -3 SD.

^bWasting is defined as a z score-for-BMI of < -2 SD.

^cUnderweight is defined as a z score-for-weight of < -2 SD.

^dOverweight is defined as a z score-for-BMI of > +2 SD.

^eStunting is defined as a z score-for-length of < -2 SD.

^fThe differences in denominators are varied due to missing data as specified in the “Results” section. Each parameter is defined by specific anthropometric input, as per the WHO definitions, and calculator, as stipulated in the “Methods” section. Thus, some parameters are mutually exclusive while others are not.

^gThe differences in denominators for underweight in > 59 months are because underweight cannot be calculated for children > 120 months as described in the “Results” section.

Table 2 Association between age group (0–59 vs. >59 months) and severe wasting^a, wasting^b, underweight^c, overweight^d, and stunting^e

| | Age group (0–59 vs. > 59 months) | |
|----------------|----------------------------------|---------|
| | OR ^f ; 95% CI | p-Value |
| Severe wasting | 1.18; (0.41–3.45) | 0.757 |
| Wasting | 1.18; (0.48–2.93) | 0.709 |
| Underweight | 1.15; (0.43–3.12) | 0.77 |
| Overweight | 2.72; (1.36–5.47) | 0.005 |
| Stunting | 2.08; (1.03–4.19) | 0.04 |

Abbreviations: BMI, body mass index; CI, confidence interval; OR, odds ratio; SD, standard deviation.

^aSevere wasting is defined as a z score-for-BMI of < -3 SD.

^bWasting is defined as a z score-for-BMI of < -2 SD.

^cUnderweight is defined as a z score-for-weight of < -2 SD.

^dOverweight is defined as a z score-for-BMI of > +2 SD.

^eStunting is defined as a z score-for-length of < -2 SD.

^fOR refers to ratio of the odds of the event in the 0 to 59 months age group to the odds of the event in the > 59 months age group.

study found the overall prevalence of stunting (10.3% [95% CI, 7.16%, 13.45%]) among Syrian refugee children age 0 to 59 months to be of medium severity, as defined by WHO prevalence thresholds. This is higher than the prevalence of stunting reported by a nutritional profile conducted by the International Organization for Migration (IOM) from 2015–2016, which found the prevalence of stunting in Syrian refugee children aged between 6 to 59 months to be 7.5% (95% CI, 6.9%, 8.2%), similar to another nutritional profile conducted from 2013–2014 in Jordan, Lebanon, and Iraq, which reported a prevalence of 10.5% (95% CI, 7.6%, 14.4%), and likely lower than the prevalence reported by the 2010 World Bank Health Nutrition and Population Statistics for Syria, which reported 27.9%.^{7,15,16} The overall prevalence of wasting (5.57% [95% CI, 3.19%, 7.94%]) in the 0 to 59 months age group was also medium severity by WHO thresholds. This is similar to the prevalence of wasting reported by the IOM's nutritional profile, which reported 4.1% (95% CI, 3.6%, 4.7%), and higher than the 2013–2014 nutritional profile, which reported 0.8% (95% CI, 0.3%, 2.2%) and likely lower than the 2010 World Bank's statistics, which reported 11.5%.^{7,15,16}

The prevalence of overweight (16.36% [95% CI, 10.71%, 22%]) in the 0 to 59 months age group was high severity by WHO thresholds. This was lower than the prevalence reported by the 2010 World Bank's statistics, which found prevalence of overweight to be 17.9%.¹⁶ Although WHO does not define prevalence thresholds for ages > 59 months, we found the prevalence of stunting to be 7% (95% CI, 3.57%, 10.85%), severe wasting 4% (95% CI, 0.98%, 6.23%), wasting 5% (95% CI, 2.04%, 8.26%), overweight 7% (95% CI, 3.18%, 10.21%), and underweight 5% (95% CI, 1.26%, 7.88%).

This data is thus interesting, as all of the prevalence values reported by the World Bank Health Nutrition and Population Statistics for Syria in 2010, which reflects preconflict data, appear worse than that reported by subsequent nutritional profiles.

Furthermore, the 2013–2014 nutritional profile suggested rates of acute malnutrition (defined by weight-for-height z scores and prevalence of edema) in Syrian refugee children, who were between 6 to 59 months of age, were < 5% in all regions and not increased relatively or increased absolutely by the WHO's standards, although this survey did identify significantly higher levels of anemia.⁷

Those in the 0 to 59 months age group were also more likely to be stunted and overweight, which suggests greater impact on the younger population, either due to an intrinsically increased susceptibility, to greater length of exposure to their current environmental circumstance, or to both. These findings may be attributed to poorly balanced diets. However, it is possible that our measurements of weight were inflated by winterwear, as noted in the description of this study's limitations below. If this were the case, our study may potentially reflect grossly normal weights in this population, although we would not anticipate any significant impact on the reported prevalence of stunting.

As the Syrian conflict is still ongoing and refugee families remain displaced, poverty and food insecurity remain a high concern. In the time since these prior assessments were completed, the number of Syrian refugees in host communities continues to increase in Jordan, resulting in increased strain on public services and rising prices for rent and basic goods, with increased levels of vulnerability and food insecurity for refugees.¹⁷ There have also been policy changes regarding refugees in Jordan. Beginning in January 2018, the Jordanian government removed subsidies for several basic food items for refugees.¹⁸ Refugee households have had to significantly increase the resources they spend on food, and compared with only 23% in 2016, 44% of households spend more than 40% of total expenditures on food, which may be in part a result of this removal of subsidies.¹⁸ According to the UNHCR, food security also decreased from 2016–2018 for refugees living in host communities in Jordan. Only 20% of registered Syrian households were food secure, compared with 28% in 2016.¹⁸ Furthermore, in February 2018, changes in government regulations prevented Syrians in Jordan from accessing the noninsured rate for health care and instead had to pay 80% of the “foreigner rate.” This translated to a two-to-five-fold increase in health-associated costs. However, as of April 2019, the Jordanian government reversed this policy so that Syrians could access subsidized health care.¹⁷

There were several limitations to this study. First, this was a convenience sample, which does limit the strengths of inferences that can be made. It is possible that malnourished children were more likely than healthy children to present to the clinic. It is also possible that children may have been included more than once, as there were no measures in place to account for repeat visits by a child. This is because that data for this study were collected during a 6-day mission trip, where health care providers were volunteers, clinics were overwhelmed, and documentation was minimal, which did lead to other limitations as well. Due to the difficulties with data collection, standardization was not attainable, and the margin of error was thus increased. These include potential for imprecise reported age, user-dependent variation in anthropometric data collection, inaccuracies in true weight given weight-clothing, inability to include all children who presented to clinics, and inability to control for repeat data points.

Conclusion

This study shows that the Syrian refugee crisis may be having a significant effect on childhood nutrition and possibly resulting in wasting and stunting in Syrian refugee children living in Jordan. These findings should be concerning in the light of the known food insecurity and lack of food diversity that refugees face. We encourage further studies to be completed to provide a comprehensive assessment of the current nutrition status of Syrian children. As the crisis continues, it is of utmost importance that relief and resettlement efforts persist, with an emphasis on making sure Syrian children have access to adequate and nutritious food.

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Conflict of Interest

A.V. is a member of the Syrian American Medical Society. N.K. is a member of the Syrian American Medical Society. A.K. has no relevant disclosures. L.M. has no relevant disclosures. M.A. is a member of the Syrian American Medical Society.

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