Preliminary Cross-Sectional Screening for the Assessment of Macronutrient Consumption and Body Mass Index in Orphans Aged 7 to 15 Years in Amman, Jordan

الفحص التحليلي لتقدير استهلاك المغذيات الكبيرة ودليل كتلة الجسم في دور الأيتام (7 إلى 15 سنة) في عمان، الأردن

Hadeel Ghazzawi

هديل غزاوي

Department of Nutrition and Food Science, Agriculture College, University of Jordan, Amman, Jordan.

Corresponding author: h.ghazzawi@ju.edu.jo

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ملخص

الهدف من هذه الدراسة هو فحص سوء التغذية من خلال تقييم كمية المغذيات الكبيرة وحساب نسبة مؤشر كتلة الجسم (BMI) إلى عمر الأيتام في 7 دور أيتام مختارة حكومية في عمان، الأردن. وشملت الدراسة 277 يتيماً. 156 فتاة و121 فتى تتراوح أعمارهم بين 7 إلى 15 سنة. تم تعيين التقييمات الغذائية (مؤشر كتلة الجسم و 3 أيام تذكر سجل الغذاء) من قبل خبراء التغذية المدربين. تم تحليل محتوى المغذيات الكبيرة بواسطة برنامج .EISHA النتائج: كانت نسبة مؤشر كتلة الجسم إلى العمر بالنسبة للأيتام في النطاق الطبيعي الأدنى للبنين والبنات (18.8، 20.73)؛ على التوالي. تلبية المغذيات اليومية من المغذيات الكبيرة المتطلبات لمجموعاتهم العمرية. الخلاصة: إن غالبية الأيتام الذين تم تقييمهم من دور الأيتام في عمان كان وزنهم سليمًا وقد استوفوا توصية المغذيات الكبرى ومآخذ الطاقة. يجب تحسين عادات الأكل. وينبغي أن تنطبق هذه التغييرات على تحسين مدخول دور الأيتام في المغذيات من الوجبات الغذائية الكثيفة. وهذا يشير إلى أن الأيتام في عمان لا يعانون من سوء التغذية ، ولكن يجب تعديل جودتهم الغذائية.

الكلمات المفتاحية: أيتام، دور الأيتام، سوء التغذية، العناصر الغذائية الكبرى.

Abstract

The aim of this study was to screen for malnutrition by evaluating macronutrient intake and calculating the ratio of body mass index (BMI)

to age of orphans in 7 selected governmental orphanages in Amman, Jordan. The study recruited 277 orphans, including 156 girls and 121 boys aged 7 to 15 years. Nutritional assessments (BMI and 3 days food recall) were recorded by trained nutritionists. Macronutrient content was analyzed by EISHA software. The ratio of BMI to age among orphans was at the lower end of the normal range for boys and girls, at 18.8 and 20.73, respectively. The macronutrient daily intake of orphans met the requirements for their age groups. The majority of assessed orphans from orphanages in Amman had proper body weights and met the recommendations for macronutrient and energy intake. However, eating habits should be improved. Changes should be applied to improve the provision of nutrient-dense foods to orphanages. In summary, our study shows that orphans in Amman do not suffer from malnutrition, but their dietary quality should be adjusted.

Keywords: Orphan, orphanages, macronutrients, malnutrition.

Introduction

Malnutrition remains an important problem in certain parts of the world. It contributes to more than 60% of the 10 million child deaths each year (WHO, 2017, Stevens *et al*., 2017). Malnutrition is mainly caused by dietary inadequacy with respect to children's needs (WHO, 2017). It results from the consumption of a poor diet (quality and/or quantity) over a long period of time. Malnutrition is predominant in low- and middle-income countries (Cumming and Cairncross, 2016, Park, 2005).

In the developing world, 43% of children are stunted, and 9% are wasted (Park, 2005). In the third world, protein-energy malnutrition (PEM) is a serious concern among school-age children who are deprived of good and ample nutrition, which may be due to a lack of health promotion facilities, ignorance, and poor socioeconomic status (Khan *et al*., 1990). Thus, nutrition plays a vital role in proper growth in the initial years of life (Huq *et al*., 2013).

An orphan is a child who is permanently bereaved of or abandoned by his or her parents (Karim and Zahid, 2013). An orphanage is an institution

devoted to the care and rearing of children who have lost their parents. The orphanage is responsible for the child's physical and psychological development and for providing adequate living conditions (Lone and Ganesan, 2016).

Nutritional screening of orphans' growth and development is monitored by weight, height and nutritional status (Sadowska *et al.*, 2010, Sbruzzi *et al.,* 2013). Generally, the assessment of childhood undernutrition is assessed by three categories according to World Health Organization (WHO): underweight: weight for age at least 2 standard deviations (SD) below the WHO Child Growth Standards median; stunting: height for age at least 2 SD below the WHO Child Growth Standards median; wasting: weight for height at least 2 SD below the WHO Child Growth Standards median; and overweight: weight for height at greater than 2 SD above the WHO Child Growth Standards median (WHO, 2006).

Children and adolescents belong to the groups most vulnerable to unhealthy nutritional intake. However, children who are orphans are at greater risk of unhealthy nutritional intake than average children (Subbarao and Coury, 2004, Pysz *et al.*, 2015). Hence, it is sensible to review studies concerning the assessment of nutritional status, food intake habits and physical activity (Pysz *et al.*, 2015).

Measures associated with the prevention of malnutrition should be directed first toward the younger generation of society. Additionally, the children's parents, guardians and teachers should be addressed. The major objectives of programs for the prevention and treatment of malnutrition should be to modify and alter nutritional habits and promote physical activities. To the best of the author's knowledge, very limited nutritional screening actions are taken for orphans in Jordan. The work presented in this paper can be considered the first preliminary cross-sectional study to assess malnutrition (over/undernutrition) among orphans in Amman, Jordan. The aim of this study was to evaluate the nutritional status, health status and intake of energy and macronutrients of orphans in the main governmental orphanages in Amman.

Materials and Methods

A preliminary cross-sectional screening study was conducted among 7 governmental orphanages located in Amman. The study included 350 orphans below the age of 18 years in Amman City. Ages of the subjects were confirmed by their birth certificates or from their health cards. An orphan was considered a child if aged between 7 and 10 years and adolescent if aged between 11 and 15 years (Brown, 2015). The anthropometric data were collected based on standard methods (USDA, 2010, Natale and Rajagopalan, 2014). Trained nutritionists carried out height and weight measurements in triplicate. These measurements were obtained from all orphans. The orphans were weighed while wearing minimal clothes and without shoes, and the average was calculated and recorded to the nearest 0.5 kg (for weight) and to the nearest 0.1 cm (for height). Standing height was measured using a stadiometer (Seca 214; Seca, Hamburg, Germany), and weight was assessed using digital scales (Seca 835; Seca, Hamburg, Germany). The WHO BMI cutoffs were used to group BMI status using the website of the Centers for Disease Control and Prevention/BMI Percentile Calculator for Children and Teens. The BMI of children is sex and age specific (Hammer et al., 1991; Pietrobelli et al., 1998). Because BMI changes substantially as children become older, BMI-for-age is the measure used for children aged 2 to 20 years (CDC, 2017).

Overweight is the term preferred for describing children and adolescents with a BMI-for-age equal to or greater than the 95th percentile of BMI-for-age or weight-for-length.

The 85th percentile is included on the BMI-for-age and the weight-for-stature charts to identify those at risk of being overweight. The cutoff for underweight of less than the 5th percentile is based on the WHO Expert Committee on Physical Status (WHO, 2017).

Total energy and macronutrient (protein, fat and carbohydrate) intake was assessed by 3 days' recall under the supervision of trained nutritionists (by asking the meal planners); total energy and macronutrient intake was analyzed using EISHA software. Meal planners could be the biological

mother (when the father has passed away), an alternative mother (when a poor women has no children or home and is provided a place to live that is donated by an orphanage), mother of the house (the cooks of an orphanage), relatives (a member of the orphan's family who is paid by an orphanage to cook for the orphan who lives in his/her relative's place), or the Ministry of Social Development in Amman, Jordan. The last entity supplies the orphanages with a ready diet program that the orphanage residence should comply with and introduce to the orphans.

Statistical analysis was performed using SPSS for Windows (Rel. 22.0, 2013, Chicago: SPSS Inc). Mean differences were examined using one-way analysis of variance (ANOVA). Data are presented as the mean ± SD. Differences between the means were considered significant at a p-value < 0.05. For tabular data, Microsoft Word and Microsoft Excel 2013 were used.

Results

The cross-sectional preliminary screening study was carried out in 7 governmental orphanages located in Amman, Jordan. Out of 350 orphans, only 277 orphans were able to complete the requested food recall. The study population included 156 girls and 121 boys aged 7 to 15 years. There were 136 children who were matched by sex and 141 adolescents (53 boys and 88 girls).

Table 1 shows that the mean age for the groups of children and adolescents were 8.32 ± 1.26 and 13.05 ± 1.89 years, respectively. The BMI for children and adolescents was 18.8 and 20.7 (kg/m^2), respectively. In addition, the BMI-for-age was in the 90^{th} percentile for both groups. The dietary intake of carbohydrates contributed 52% and 53% of the total energy intake (1695 ± 494 and 1837 ± 615 kcal/d) for children and adolescents, respectively. The dietary intake of fat was 31% and 32% of the total energy intake for children and adolescents, respectively. In addition, the dietary intake of protein was 13.9% and 14.3% of the total energy intake for children and adolescents, respectively.

Table (1): Anthropometric measurements and macronutrient intake of orphans based on age categories.

Variables *	Children ** (n = 136)	Adolescents *** (n = 141)
Age (y)	8.32 ± 1.26	13.05 ± 1.89
Height (cm)	125.52 ± 11.47	149.05 ± 11.29
Weight (kg)	27.48 ± 5.86	46.97 ± 12.19
BMI (kg/m²)	18.80 ± 5.61	20.73 ± 16.10
BMI-for-age	90th percentile	90th percentile
Energy (kcal/day)	1695 ± 494	1837 ± 615
Carbohydrate%	52.04 ± 11.01	52.98 ± 6.34
Fat%	31.0 ± 33.23	32.20 ± 7.20
Protein%	13.96 ± 3.6	14.28 ± 4.47

*Data are presented as the mean ± SD
** children are aged between 7 -10 years
*** adolescents are aged between 11- 15 years

Table (2) shows that the main meal planner for most of the children was the real mother (67%), whereas alternative mothers least often contributed to meal planning for this age group (15%).

Table (2): Sex and meal planner frequency for children (7-10 years)

		N	%
Sex	Male	68	50.0
	Female	68	50.0
Meal Planner	Real mother	91	67.0
	Alternative mother	21	15.4
	Mother of the house	5	3.7
	Relatives	6	4.5
	Ready program from the Ministry of Social Development with supplies to orphanages	5	3.7
	No data available	8	5.7

In the case of adolescents, real mothers made up 48% of the meal planners, whereas the alternative mothers constituted approximately 30% of the meal planners, as shown in Table 3.

Table (3): Sex and meal planner frequency for adolescents (11-15 years).

		N	%
Sex	Male	53	37.6
	Female	88	62.4
Meal planner	Real mother	68	48.0
	Alternative mother	42	30.0
	Mother of the house	23	16.3
	Ready program from the Ministry of Social Development with supplies to orphanages	8	5.7

Discussion

In the available literature, there is a lack of research concerning the nutritional status of children from orphanages worldwide (Lone and Ganesan, 2016). This preliminary cross-sectional study aimed to assess the nutritional status of children and adolescents from 7 governmental orphanages in Amman, Jordan.

Differences between males and females were not significantly detected which is explaining due to the similar meals offered to the orphans. It was quite clear that most of the orphans among the Amman orphanages received their meals from their biological mothers (67% of children and 48% of adolescents), which might explain the adequate dietary energy intake. Such mothers send their children to the orphanages for education and received money weekly through a donation that differs from one orphanage to another. Financial support might vary depending on the donations received by the orphanages. Most of the donations were either food or clothes. Therefore, meal planners did not have an option to vary the meals in many cases. It is encouraging that these dietary intakes were parallel to those of the orphans who lived in the orphanages. The lowest percentages of received meals were from the ready program that

the Ministry of Social Development supplies to the orphanages (3.7% for children and 5.7% for adolescents). Such results suggest that more efforts should be directed toward the donation amount provided to biological mothers from the orphanages and, second, toward developing nutritional awareness in mothers with regard to the dietary intake prepared for their orphans.

Three-day recalls that were obtained from the 277 orphans showed that total energy and the percentage of macronutrient intake met the USDA guidelines. This study shows that the percentages of protein consumed by children and adolescents were both approximately 14%; fat intake averaged 31-32%, and carbohydrate intake was approximately 52%. According to the USDA 2015, for children aged 6-11 years, the mean percentages for food energy from carbohydrates should average 53.8%, from protein should average 13.8% and from fat should average 33.9%. Our results show slight differences from the percentages recommended by the USDA, which explains the shifting of the BMI scale to the lowest border of the normal weight range (18.5 to 24.9 kg/m^2). However, the BMI calculator does not provide any clinical guidance. It is considered a screening tool to indicate body fat via calculations from weight and height (CDC, 2017). However, according to Hammer *et al*., 1991 and Pietrobelli *et al.,* 1998, the BMI-for-age scale is more precise for categorizing malnutrition. Our results show that for Ammanni orphans, the BMI-for-age results were in the 90^{th} percentile, which is considered normal and does not indicate malnutritional deficiencies; however, these children are at risk of developing some metabolic complications (Himes and Dietz, 1994).

From the three-days-recall data, fat and carbohydrate portions were mainly acquired from processed foods such as fried food, sweets and easily available foods. In Jordan, people prefer to donate foods such as meat, rice, candies and convenience food items. Donations of fish, fruits, vegetables or nuts are not common practice due to the high price of these items plus the low satiety index of such foods (Holt *et al.,* 1995).

Fruit and vegetable servings were not an objective of this study; although these data were recorded by the interviewers, they were not calculated. Therefore, additional research should focus on this matter.

It is beneficial to shed some light on the cultural and religious motivations in Jordanian society to donate to orphanages. Islam is Jordan's official religion, and one of its five pillars is to give compulsory donations to the needy. Orphans form one of the main groups of the needy in this society. Therefore, the issue is not the amount of donations received at orphanage houses but the quality of the donated food consumed by the orphans.

Nutritional education should be considered an important part of teaching programs to improve the quality of food presented rather than simply focus on the quantity of food consumed.

Conclusions

The majority of assessed children and adolescents from Amman orphanages had an acceptable body weight. Nevertheless, their eating habits should be improved by providing varied and healthy food items. Our findings suggest that orphans in Amman do not suffer from malnutrition, but their dietary pattern should be improved and supervised.

Further suggestions

It is necessary to assess the micronutrient status among orphanages to determine any shortcomings for children and adolescents at these critical stages of development. The quality of the food items should be assessed, and the micronutrient status should be associated with biochemical data.

This study ascertains that malnutrition did not affect orphans in Amman, Jordan. In addition, this study will help researchers explore the importance of food quality rather than food quantity.

Statement on conflicts of interest:

None declared.

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