

The prevalence of malnutrition among 2-6 year old children in Kerman rural kindergartens, Kerman, Iran, 2012

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Abstract

Introduction: Infants and young children are the most vulnerable groups to malnutrition. Malnutrition can cause child growth disorders. Child growth measurement is a basic instrument to measure child malnutrition. This study was conducted to determine the prevalence of malnutrition among 2-6 year old children in Kerman rural kindergartens.

Methods: This descriptive cross-sectional study was conducted on 1154 children under 6 years old. Weight and height were measured using a standard instrument and method. Data entry was performed by SPSS version 18. It is recommended to assess child growth in developing countries by using WHO Anthro software. So, weight, height and BMI for age indicators were calculated by WHO Anthro software based on Z-score. For data analysis, *t*-test and χ^2 test were applied accordingly.

Results: 1154 children (597 boys and 557 girls, mean age 58.4 ± 10 months) were evaluated. Severe, medium and mild stunting (defined as height for age below the $-1Z$ -score) prevalence was observed in 1.6%, 5.5% and 19.1% of children respectively. Severe, medium and mild underweight (defined as weight for age below the $-1Z$ -score) prevalence was observed in 0.7%, 6.7% and 26% of children respectively. Severe, medium and mild wasting (defined as BMI for age below the $-1Z$ -score) prevalence was observed in 1.3%, 9.5% and 25.6% of children respectively. Overweight (defined as BMI for age above the $+2Z$ -score) and obesity (defined as BMI for age above the $+3Z$ -score) were observed in 4.5% and 2.4% of children respectively. No significant difference for malnutrition prevalence was observed between boys and girls ($p > 0.05$).

Conclusion: Findings show that underweight and wasting prevalence in studied children based on WHO criteria is high. Thus, reducing malnutrition in rural children of Kerman should be considered as a health priority in this community.

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Introduction

Generally, the malnutrition term defines both under and over nutrition that basically affects all population

groups, but the most vulnerable groups are infants and young children (1).

Malnutrition in children under five years is regarded as the most important nutritional term due to the rapid child growth and immune system development (2).

Child malnutrition in low and middle-income countries (LMICs) includes both under-nutrition and an increasing problem of overweight and obesity (3).

Child malnutrition can lead to poor cognitive and socioemotional performance, lowering educational achievement, and considering it in children under 5 years in LMICs should be a top priority in order to promote the social and economic development for human(4).

Malnutrition inducing main factors includes poor diet and infections, especially in poor communities. Poor diet and diseases have close relationship to the health standard indicator (1). Child growth measurement is a basic instrument to measure child malnutrition (5).

Child body measures and age combination are common anthropometric indicators (1). Stunting, wasting, underweight (Under nutrition), overweight and obesity (over-nutrition) are those indicators (4).

There are a lot of documents indicating that child growth assessment, height and weight indices in well-nourished and healthy children with ethnic diversity and different continents, is remarkably the same, especially up to six years (1). These anthropometric indicators are known as important indicators of nutritional assessment in any populations (4, 6).

Child under nutrition is a critical issue due to its short and long-term effects. Undernourished children are more affected to incapability and chronic disease in comparison to well-nourished children (7). Moreover, under-nutrition is known as the worldwide

health concern (8). Recent research has shown that childhood weight gain is related to adulthood cardiovascular disease (CVD) and type 2 diabetes (T2DM) (9).

On September 20, 2013, the joint database of UNICEF, WHO and the World Bank on child malnutrition were updated and then a new global and regional estimate for 2012 was released. The global and regional estimates of wasting and severe wasting indices in children were released for the first time. The main finding of this note shows that 162 million under five years were stunted in 2012 and the global trend in stunting prevalence and burden continues to decrease. Other finding shows that 99 million under five years were underweight in 2012 and the global trend in underweight prevalence continues to decrease but at a slow rate (10).

The note also indicates that 51 million under five were wasted and 17 million were severely wasted in 2012 (10).

Several studies have been conducted in Iran in recent years: the prevalence of stunting in children under 6 in south Khorasan was 45%, and the prevalence of wasting and underweight were 31.2% and 47.8% respectively (11). The rates of stunting, underweight, and wasting among children under six were 9.53, 9.66, and 8.19%, respectively in Fars province of Iran (12). The prevalence of malnutrition based on underweight, stunting, and wasting among urban and rural children under 5 was estimated to be 2.3%, 7.3%, and 1.4% respectively in north of west Azerbaijan (13).

There is no evidence concerning the prevalence of malnutrition in the form of undernutrition among children under 6 years of age in Kerman province. Despite the importance of over-nutrition assessment, there is not a study regarding the overweight and obesity prevalence among

children in Kerman as well as WHO Anthro software. It is recommended to assess child growth in developing countries by using WHO Anthro software. This study was conducted to assess all levels of malnutrition prevalence among children in rural kindergartens of Kerman using WHO Anthro software for the first time.

Methods

This cross-sectional study was undertaken on all children under 6 years of age in rural kindergartens of Kerman, southeast of Iran in 2012. All these rural kindergartens were covered by Kerman Welfare Center. The studied population encompassed 1154 children under 6 years of age (24-71 months) which were selected based on census sampling in a program named "Provide a hot meal in rural kindergartens". Our exclusion criteria included children with physical and mental retardation signs and diseases.

Essential indicators for analysis and interpretation of nutritional status at national level are age (in months), sex, height (in meters) and weight (in kilograms) (1).

Child information including age, sex, weight and height was collected as below:

The weight of children was measured using an analog scale (Seca, German) with 100 g precision. Weight measurement was performed with light clothes and without shoes. Concerning scale precision, the scale was calibrated before weight measurements.

The height of children was measured using a tape meter with 0.1 cm precision that was fixed to the wall with a 90° angle to floor. Height measurement was performed in anatomic status and without shoes.

Age of children was assessed by birth certificates which were registered in kindergarten documents.

All these measurements were done in duplicate. If the two measurements were discrepant, a third measurement was taken and then the two closest were selected. Finally, the mean of two anthropometric indices were used. For these indices in the form of height-for-age (HAZ), weight-for-age (WAZ) and body mass index for age (BAZ), Z-scores were used. World Health Organization values were applied as standard value and the indices were calculated by using WHO Anthro software v.3.2.2 (Department of Nutrition, WHO, Geneva).

Based on WHO definition, stunting is defined as height for age below the -1Z-score, underweight is defined as weight for age below the -1Z-score, wasting is defined as BMI for age below the -1Z-score, overweight is defined as BMI for age above the +2Z-score, and obesity is defined as BMI for age above the +3Z-score.

Data entry was performed using *SPSS version 18* software. Kolmogorov-Smirnov test was applied to determine variable distribution. *T-test* was utilized to compare mean variables between both sexes. χ^2 test was applied to compare the prevalence of stunting, underweight, wasting overweight and obesity between different ages and genders. $P < 0.05$ was considered statistically significant.

Results

In this research, 1154 children under 6 years (between 24-71 months), including 597 boys (51.6 %) and 557 girls (48.4%) were studied.

Table 1 shows the mean indices of age, height, weight in both sexes. Mean age did not show a significant difference ($p=0.4$) between boys and girls. Mean of height and weight in boys was significantly more than girls ($p=0.002$) based on *t*-test.

Table 1. Mean indices of age, height and weight in studied boys and girls, Kerman rural kindergartens, 2012.

index	gender	N (%)	Mean±SD	p-value
Age (month)	boy	597(51.6)	58.7±9.97	0.4
	girl	557(48.4)	58.1±10.3	
	total	1154(100)	58.4±10.1	-
Height(cm)	boy	597(51.6)	108.1±7.7	0.002
	girl	557(48.4)	106.8±8	
	total	1154(100)	107.5±7.8	-
Weight (kg)	boy	597(51.6)	17.3±3.5	0.002
	girl	557(48.4)	16.7±3.2	
	total	1154(100)	17±3.4	-

According to table 2, no significant difference was observed between boys and girls in terms of mean±SD for three indices; height for age ($p=0.17$), weight for age ($p=0.27$) and BMI for age ($p=0.91$) based on *t*-test.

Table 2. Mean indices of height for age, weight for age and BMI for age in studied boys and girls, Kerman rural kindergartens, 2012.

index	sex	N	Mean±SD	p-value
height for age	boy	597	-0.17±1.3	0.17
	girl	557	-0.27±1.1	
	total	1154	-0.22±1.25	-
Weight for age	boy	597	-0.48±1.1	0.27
	girl	557	-0.55±1.1	
	total	1154	-0.51±1.1	-
BMI for age	boy	597	-0.6±1.4	0.91
	girl	557	-0.59±1.3	
	total	1154	-0.6±1.3	-

According to table 3, the prevalence of severe, moderate and mild stunting was observed in 1.6%, 5.5% and 19.1% of the studied children respectively. This prevalence was observed in 1.3%, 5.3% and 18.7% of girls respectively and in 1.8%, 5.7% and 19.5% of boys respectively. No significant difference was observed between boys and girls based on χ^2 test ($p=0.8$). The prevalence of severe, moderate and mild underweight was observed in 0.7%, 6.7% and 26% of the studied

children respectively. No significant difference was observed between boys and girls based on χ^2 test ($p=0.9$). The prevalence of severe underweight was the same in boys and girls (0.7%), but the prevalence of moderate underweight in boys was a little more than girls (6.9% and 6.5% respectively). The prevalence of mild underweight in girls was more than boys (26.9% and 25.1% respectively). The prevalence of severe and moderate wasting was observed in 1.3% and 9.5% of

the studied children respectively. The prevalence of overweight and obesity was observed in 4.5% and 2.4 % of the studied children respectively. No significant

difference was observed between boys and girls based on χ^2 test ($p=0.1$).

Table 3. Stunting, underweight, wasting, overweight and obesity status in studied children in Kerman rural kindergartens, 2012

sex	stunting				underweight				wasting			overweight	obesity	p-value
	Mild N(%)	Moderate N(%)	Severe N(%)	p-value	Mild N(%)	Moderate N(%)	severe N(%)	p-value	mild N(%)	moderate N(%)	severe N(%)			
Boys	116(19.5)	34(5.7)	11(1.8)		149(25.1)	41(6.9)	4(0.7)		141(23.8)	57(9.6)	24(4.1)	17(2.9)	29(4.9)	
Girls	103(18.7)	29(5.3)	7(1.3)	0.8	149(26.9)	36(6.5)	4(0.7)	0.9	151(24.6)	51(9.3)	11(2)	11(2)	23(4.2)	0.1
total	219(19.1)	63(5.5)	18(1.6)		298(26)	77(6.7)	8(0.7)		292(25.6)	108(9.5)	35(1.3)			

According to table 4, despite the highest prevalence of severe and moderate stunting in two-year old children (12.9%) and mild stunting in three-year old children (20.5 %), no significant difference was observed between different age groups ($P=0.05$). All kinds of underweight prevalence showed a significant difference at different age groups ($p=0.02$) based on χ^2 test. The prevalence of underweight in children at 24 to 35 months was less than the others. According to this table, there was a significant difference concerning the

prevalence of wasting with respect to age using χ^2 test ($p=0.001$). The prevalence of severe, moderate and mild wasting in children at 24 to 35 months was less than the others. We observed a significant difference concerning the prevalence of overweight and obesity based on different age groups ($p=0.001$) using χ^2 test. The prevalence of overweight was the highest in children aged 24 to 35 months (9.7%). Children aged 60 to 71 months had the highest prevalence concerning obesity (4.2%).

Table 4. The prevalence of severe, moderate, mild stunting, under-weight, wasting and over-weight, obesity in studied population based on different ages, Kerman rural kindergartens, 2012.

Age(months)	Mild stunting (N)%	Severe and moderate stunting (N)%	p-value	Mild underweight (N)%	Severe and moderate underweight (N)%	p-value	Mild wasting (N)%	Severe and moderate wasting (N)%	p-value	overweight (N)%	obesity (N)%	p-value
24-35	7(22.6)	3(9.7)		4(12.5)	0(0)		2(6.5)	1(3.2)		3(9.7)	0(0)	
36-47	30(20.5)	7(4.8)	0.05	35(24)	7(4.8)	0.02	29(19.9)	17(11.6)	0.001	2(1.4)	0(0)	0.001
48-59	61(18)	29(8.6)		88(26)	19(5.6)		85(25.1)	32(9.5)		7(2.1)	1(0.3)	
60-71	122(19.3)	41(6.5)		171(27.1)	59(9.4)		176(28.2)	93(14.9)		40(6.4)	27(4.2)	
Total	220(19.2)	81(7.0)		298(26)	85(7.4)		292(25.6)	143(12.5)		52(4.5)	28(2.4)	

Discussion

Anthropometric measurement is the best way to assess child growth (1). The comparison between the mean of weight among rural children in Kerman with WHO standard of 58-month children (14) indicates that the mean of weight in both sexes was lower than the WHO standard. Also, the mean of height among children in Kerman was lower than the WHO standard. However, the interstice with the 50th percentile in boys was less than girls (in boys it was 108.1 to 108.8 cm and in girls it was 106.8 in comparison with 108.3 in standard girls)

Evidence shows that the prevalence of stunting among rural children in Kerman (26.2%) was higher than other provinces such as East Azerbaijan (3.7%) and Fars (9.53%), but in comparison with South Khorasan Province (45%), the children in Kerman showed a better status. Also, the prevalence of under-weight in Fars, East Azerbaijan and South Khorasan province was 66.9%, 2.3% and 47.8% respectively, and in the present study, this was 33.4% among children aged under six. Our study showed that Kerman had the highest prevalence of wasting among children under the age of 6 (36.4%) compared to other three provinces, followed by South Khorasan (31.2%), Fars (19.28%), and East Azerbaijan (4/1%).

The prevalence and pattern recognition for malnutrition, especially stunting in children as a serious risk factor which causes cognitive impairment, poor educational achievement and inefficient manpower production in later life, is an essential and important component of public health policy. (15). Generally, in this study, the prevalence of stunting in children decreases as age increases in children.

The prevalence of moderate and severe wasting among children was 12.5%, which is much higher than the average of rural areas of Iran (2.9%), and the prevalence of wasting increases with age in both sexes. At the other end of the spectrum, the prevalence of overweight was 4.5% and the prevalence of obesity was 2.4% among children, which is greater than the national average of overweight and obesity in rural children (5.4%). This suggests being in a transitional phase of nutrition from deficiencies to increasing energy and nutrient intake, similar to many cities and countries around the world.

Children underweight is a key indicator of the state's assessment in order to achieve the Millennium Development Goals and more than a quarter of the world under 5 are still underweight (16, 17). Our study found that 7.4% of children with moderate and severe underweight and 26% of them suffered from mild underweight. In this study, the prevalence of underweight was relatively high and the prevalence of underweight in girls and boys was similar.

There is not a study concerning the prevalence of overweight and obesity among children in Kerman based on WHO Anthro software. This study assessed all levels of malnutrition prevalence among rural children in Kerman using WHO Anthro software. Although it is one of the strongest points of this study, but lack of information about demographic data can be considered as a limitation of this study. Therefore, collecting demographic data as well as child malnutrition monitoring are suggested for future studies.

Conclusion

Findings show a high prevalence for underweight and wasting in the studied children based on WHO criteria. This emphasizes on more work and effort to decrease the

prevalence of malnutrition in children under 6 years of age. By the same token, monitoring underweight and wasting should be considered as a health priority in rural children in Kerman.

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