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# Nutritional Intervention on Childhood Malnutritionin of Rural Nurseries in Qazvin Province, Iran

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Article information	Abstract		
Article history: Received: 9 Jan 2012 Accepted: 23 Apr 2012 Available online: 30 Oct 2012 ZJRMS 2013; 15(3): 55-58 Keywords: Intervention study Rural Nursery	<b>Background:</b> Malnutrition is one of the major causes of mortality and morbidity in children. Not only include acute effects on children's health, but also it has long-term effects on their cognitive development and economic growth in the society. Wasting (weight for height with $Z < -1$ ) is one of the malnutrition indices in children. The aim of this study was to determine the effect of a cooked meal for 175 days on the anthropometric indices of weight, height and weight for height (wasting) of 3-6 years old children in all the rural nursery of Qazvin province, in Iran. <b>Materials and Methods:</b> In this interventional study, 2385 children (48.8% female and for the formation of the study of the province of the study of the		
*Corresponding author at: Department and Laboratory of Human Nutrition, Faculty of medicine, Qazvin University of Medical Sciences, Qazvin, Iran. E-mail address: mnoroozi@qums.ac.ir	received a cooked meal based on $360\pm20$ kcal energy, 17% protein, 53% carbohydrate and 30% fat per day for 175 days at lunch time. The anthropometric indices were collected before and after the intervention. The results were analyzed using Paired <i>t</i> -test by SPSS-16 software. <b><i>Results:</i></b> Prevalence of wasting malnutrition (mild & moderate) and sever after intervention reduced from 14.2 % and 0.95 % to 12.6% and 0.5 %, respectively ( $p < 0.05$ ). Receiving a cooked meal significantly decreased wasting (15.2% to 13.2%) in all children		
	(p < 0.01). <i>Conclusion</i> : Receiving a cooked meal for 175 days had a significant reduction in wasting in all children.		

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## Introduction

One of the well-known indicators of economic development is the nutritional status of children. Growth index in the form of weight for height is an important tool for the assessment of nutritional status of children. The prevalence of nutritional indicators in the form of wasting in children less than 6 years of age is one of the ways of assessment of nutritional status of the population. This indicator is commonly practiced regularly in many countries as a measure of public health status. The recent data indicate that the prevalence of nutritional indicators is lowest in Western countries such as the United States and highest in much less developed countries such as Yemen and Nigeria [1].

Among etiologies of malnutrition, factors such as unavailability of food, instability of social conditions, infectious diseases, and lack of nutritional knowledge may be mentioned [2]. Due to need more energy and nutrients, children are more vulnerable to malnutrition [3]. Malnutrition is one of the major causes of mortality and morbidity in children. Evidence indicates that malnutrition not only has an effect on the child's health, but also it has long-term effects on cognitive and social development, physical work capacity, productivity and economic growth of the society [4]. About 35% of all preschool children in developing countries are underweight [5]. In comparison to children with normal growth, studies have shown, children with severe wasting have about 8-times higher rate of mortality and children with moderate and mild malnutrition have 4 and 2 times higher rates of mortality, respectively. This high prevalence of mortality even in children with moderate and mild malnutrition indicates that more than 50 % of mortalities in children are directly or indirectly due to malnutrition [4].

Anthropometric indices of height and weight in children are considered as the outcome of nutrition status of the community. Because of being easy and available, these indices are used frequently and would be judged the children health [6]. Wasting is defined as underweight for height (weight for height with Z< -1) a good criteria for assessing the health of children [7]. This is an acute phenomenon which is the result of a disease or crisis in the recent past so that the child has lost weight. The most common cause of wasting in children is acute diseases such as severe diarrhea, the upper respiratory infections and the crises of shortage of food in which families do not have enough food [8]. Underweight is the reflection of both types of acute and chronic malnutrition [9]. Children who are at high risk of nutritional disorders should be carefully evaluated [10].

Depending on the level of physical activity the daily energy need for 3-6 years old boys and girls is 1200-1600 kcal [11]. So far, nutritional intervention for reducing this type of malnutrition (wasting) has been made rarely or less so that its effect on reducing malnutrition rates can be assessed. This study was conducted to determine the prevalence of mild, moderate and severe malnutrition and also intervention with a daily cooked meal for 175 days in two groups of 3-6 years old children being malnourished and well-nourished in all the rural nurseries of Qazvin, Iran.

# **Materials and Methods**

This interventional study was done by a census on 2385 children of 3-6 years old including 1165 (48.8%) girls and 1220 (51.2%) boys were recruited from all the rural nurseries in Qazvin province, in 2010. Children living in villages of five regions in Qazvin, Iran from 59 rural nurseries included Qazvin (29 rural nurseries), Takestan (4 rural nurseries), Buin Zahra (5 rural nurseries), Abyek (3 rural nurseries) and Alvand (18 rural nurseries) were enrolled. Children age was controlled before entering into the study. Height was measured in a standing position without shoes and with the accuracy of 0.5 cm. Children weight was measured by trained health care team, using Seca scale, without shoes with the accuracy of 50 g under supervision of a clinical nutritionist. Height and weight measurement was done based on the WHO children growth curves standard [12, 13] which was used in health centers. The children in the rural nurseries received a daily cooked meal within 175 days at the lunch time, including lentil meal, estanboli rice, lentil with rice; potato sauce with rice and a traditional soup (Ash) were cooked at rural nurseries. No change in daily physical activity was occurred. The meals were based on 360±20 kcal energy, 17% protein, 53% carbohydrate, and 30% fat. The average amounts of energy, protein, carbohydrate and fat of the meals were calculated by Dorosty Food Processor (DFP) software, version 2003, Shahid Beheshti University, Tehran, Iran. Children were divided in two groups of with (less than M-1SD) and without malnutrition (greater than M-1SD). Wasting was defined in three categories, proportion of children whose weight for height were mild  $(-2 \le Z < -1)$ , moderate  $(-3 \le Z < -2)$ and sever (Z< -3) malnutrition. The results before and after the intervention were analyzed using paired t-test by SPSS-16 software.

## Results

This study was conducted on 2385 children of 3-6 years old. The majority number of the children who participated in this study was at the age of five, 911 (38.2 %) and the minority group was related to the age of six by 298 children (12.5 %). In the girls group at the age of 3, 4, 5 and 6 before the intervention, the mean of the weight was  $14.23\pm2.24$  kg,  $16.04\pm2.36$  kg,  $17.79\pm2.87$  kg and  $19.03\pm3.65$  kg, respectively. This index was increased after the intervention to  $15.44\pm2.34$  kg,  $17.23\pm2.47$  kg,

18.96±3.15 kg and 20.31±3.83 kg, respectively. In the boys group at the age of 3, 4, 5 and 6 before the intervention, the mean of the weight was  $15.18\pm2.35$  kg,  $16.68\pm2.72$  kg,  $18.4\pm3.11$  kg and  $19.10\pm2.90$  kg, respectively. This index was increased, after the intervention to  $16.33\pm2.34$  kg,  $17.88\pm2.87$  kg,  $19.64\pm3.26$  kg and  $20.28\pm2.90$  kg, respectively. Mean and percentiles of height and weight, before and after the intervention in 3-6 years old children summarized in table 1.

Intervention with a cooked meal significantly increased the weight in well-nourished and malnourished group (1145 g and 1267 g), respectively (p=0.001). The prevalence of mild, moderate and severe wasting in the girls after the nutritional intervention was significantly reduced from 11.7%, 4.1% and 0.7% to 9.8%, 3.3% and 0.3% respectively (p=0.001). The overall prevalence of wasting in the girls after nutritional intervention was significantly reduced from 16.5% to 13.4% (p=0.001). The prevalence of mild, moderate and severe wasting in the boys after the nutritional intervention was significantly reduced from 10.7%, 2.5 % and 0.8 to 9.3%, 2.4% and 0.4% respectively (p=0.02). Also, the overall prevalence of wasting in the boys after nutritional intervention was significantly reduced from 14% to 12.1% (p=0.001). Generally the nutritional intervention resulted in a significant reduction in the prevalence of wasting (mild, moderate and severe) from 15.2% to 13.1% (p=0.01) (Table 2).

## Discussion

This study showed the prevalence of wasting in all categories of mild, moderate and severe malnutrition among 2385 rural children of 3-6 years old was 15.2%. Intervention with cooked meal for duration of 175 days was associated with a significant reduction (2.1%) in the prevalence of wasting in these children. Malnutrition arises as a consequence of a sudden period of food shortage and is associated with loss of a person's body fat and wasting of their skeletal muscles. Many of those affected are already undernourished and often susceptible to disease [14] and failure in their growth (height or weight) [4]. Nutritional interventions are appropriate approaches in improving nutritional indices. Consistent with our result, Malekafazli and colleagues reported that by nutritional intervention the prevalence of malnutrition, in less than 5 years old children, decreased from 6.5 to 1.8% [15]. In an intervention study in two villages in India, the prevalence of wasting in 525 children of 0-5 years old was 16%. After the nutritional intervention with packed food for 8 months, 6.1% of wasting malnutrition children reached their normal weight for their age, but 25.3% of cases did not improve their weight, it may be diarrhea, recurrent respiratory infection, due to inappropriate feeding patterns and lake of parent nutritional knowledge [16]. In the present study, the prevalence of malnutrition (wasting) and its severity was more in girls than boys. This finding is in agreement with WHO reports [8].

Table 1. Percentiles	, means and standard	deviations of wei	ght and height o	f rural children befor	e and after intervention
	/				

Age(yr)		Weight (Kg)		Height (Cm)	
0.0		Before	After	Before	After
	Percentiles	†14.67 ±2.34	15.84±2.38*	94.69±9.17	97.76±9.64*
	3	11	12.39	68	69.46
	5	11.5	13	72.2	75.1
	25	13	14.5	91	94
3	50	14.5	16	96.5	100
	75	16	17	100.5	103
	95	18	19.99	105.9	110
	97	19	21	107	113
	Percentiles	$^{+16.35 \pm 2.56}$	$17.54 \pm 2.69*$	$102.66 \pm 7.7$	$105.46 \pm 7.72^*$
	3	12	13	85	88.88
	5	13	14	89	93
	25	15	16	99	102
4	50	16	17	103	106
	75	18	19	107	110
	95	20	22	114	116
	97	21	23	115	118
	Percentiles	†18.11±3.02	19.32±3.22*	108.88±6.65	11.53±6.59*
	3	13.68	14.68	96	99
	5	14	15	99	102
	25	16	17	105	108
5	50	18	19	109	112
	75	20	21	113	116
	95	23	25	118	120
	97	25	26	119	122
	Percentiles	†19.08±3.22	20.29±3.30*	112.35±5.87	115.15±5.83*
	3	14	15.5	100	103.97
6	5	15	16	102	104.95
	25	17	18	109	112
	50	19	20	112	115
	75	20	21.92	116.25	119
	95	25	26.03	122	124
	97	26	28.06	123	125

†Data represent mean±SD,\* *p*-Value = 0.001, N=2385

 Table 2. Prevalence of wasting among rural children

	Z - score	Before Fr	requency (%)	After*	Frequency (%)
Well nourished	Z≥-1	2022(84.8)		2081(86.9)	
Mild malnutrition	-2<=Z<-1	266(11.1)		228(9.8)	
Moderate malnutrition	-3<=Z<-2	79(3.1)		67(2.8)	
Severe malnutrition	Z <-3	18(0.9)		9(0.5)	
Moderate & Severe malnutrition	Z<-2	97(4.1)		76(3.3)	
Total malnutrition	Z<-1	363(15.2)		304(13.1)	
Total		2385(100)		2385(100)	

\* *p*-Value = 0.01

Perhaps this higher prevalence of malnutrition in girls could be due to traditional thought in rural community in which boys could earn more money for family by working in the factories and farms. Thus, this attitude attracts more attention of the family to get boys' nutritional need than girls, so malnutrition is less prevalent in boys in this community. However, in some other countries the opposite of this issue has been seen [17]. Its reason may be that girls tend to be trained by their mothers, especially in the kitchen and simply have more access food. The present study showed that the overall prevalence of moderate and sever wasting was 4%. Compared with neighboring countries, the rate of wasting was lower in the present study than that of Pakistan (13.2 %) and Afghanistan (6.7 %), similar to Iraq (4.8 %) and higher than Azerbaijan (2.4 %) [18, 19]. In a study in Turkey was carried out on 1400 children under the age of 5 years, the prevalence of wasting has been

reported as 8.2 % [20]. Also, in rural areas of Nigeria, the prevalence of wasting in children has been 9 % that both of those studies showed the higher prevalence compared to the present study [21]. Compared with other countries, the prevalence of malnutrition in our study has been less than that of Bangladesh, Yemen, Brazil, Egypt, Nigeria, Oman, Indonesia and more than that of United States [1]. To our knowledge this is the first intervention study with cooked meal has been done to reduce the occurrence of malnutrition in the country. In the most intervention studies in other countries the children were receiving preventive supplements with either ready-to-use supplementary foods (RUSFs) or ready-to-use therapeutic foods (RUTFs) [22]. Strengths of the study are that used cooked food that are commonly available and consumed by the public, also the meal was prepared in the nursery. Interventions in reducing child malnutrition in the country were generally based on maternal education and

monitoring the children's health in health centers. To our knowledge, this is the first intervention study with cooked meal has been done in the country. However, it must be mentioned that there are limitations in the present study including the lack of detailed information on socioeconomic status, and non-availability of data on micronutrients of dietary intake and children's physiological growth has also been during the intervention. Wasting is considered as an acute malnutrition [7] and the result of the present study showed that nutritional intervention with cooked meal for 175 days may improve the anthropometric indices and reduce acute malnutrition in children. It is recommended that nutritional intervention with cooked meal continues in other rural communities.

#### References

- 1. El Mouzan MI, Foster PJ, Al Herbish AS, et al. Prevalence of malnutrition in Saudi children: A community based study. Ann Saudi Med 2010; 30(5): 381-385.
- 2. WHO. Management of severe malnutrition: A manual for physicians and other senior health workers, Geneva 2005. Available at: www.who.int/nutrition/publications/malnutrition/en/index. html. Accessed November 17, 2009.
- 3. Walker R. Recommendations for preventive pediatric health care. Pediatrics 2007; 120: 1376-1379.
- Jenson HB, Behrman RE, Zitelli BJ, editors. Nelson textbook of pediatrics. 18<sup>th</sup> ed. Philadelphia: W.B. Saunders Company; 2008: 900-943.
- Olsen IE, Mascarenhas MR, Stallings VA. Clinical assessment of nutritional status. In: Duggan C, Watkins JB, Allan Walker W. Nutrition in pediatrics basic science and clinical applications. 3<sup>rd</sup> ed. Ontario: B.C Decker Press; 2003: 6-20.
- Hall JG, Froster-Iskenius UG, Allanson JE. Handbook of physical measurements. New York: Oxford University Press; 2007: 240-242.
- 7. Waterlow JC. Note on the assessment and classification of protein energy malnutrition in children. Lancet 1973; 2(7820): 87-89.
- 8. WHO. The WHO child growth standards. Available at: www.who.int/childgrowth/standards/en/. 2008.
- 9. WHO Multicentre Growth Reference Study Group.WHO child growth standards based on length/height, weight and age. Acta Paediatr Suppl 2006; 450: 76-85.
- Kuczmarski RJ, Ogden CL, Grummer-Strawn LM, et al. Adv Data 2000; (314): 1-27.
- 11. Mei Z, Grummer-Strawn LM, Pietrobelli A, et al. Validity of body mass index compared with other body-composition screening indexes for the assessment of body fatness in children and adolescents. Am J Clin Nutr 2002; 75(6): 978-985.
- 12. De Onis M, Garza C, Onyango AW and Borghi E. Comparison of the WHO child growth standards and the CDC 2000 growth charts. J Nutr 2007; 137(1): 144-148.

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## **Authors' Contributions**

All authors had equal role in design, work, statistical analysis and manuscript writing.

# **Conflict of Interest**

The authors declare no conflict of interest.

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- Mei Z, Ogden CL, Flegal KM and Grummer-strawn LM. Comparison of the prevalence of shortness, underweight and overweight among US children aged 0 to 59 months by using the CDC 2000 and the WHO 2006 growth charts. J Pediatr 2008; 153(5): 622-628.
- 14. Picot J, Hartwell D, Harris P, et al. The effectiveness of intervention to treat severe acute malnutrition in young children: A systemic review. Health Technol Assess 2012; 16(19): 1-316.
- Malekafzali H, Abdollahi Z, Mafi A and Naghavi M. Community-based nutritional intervention for reducing malnutrition among children under 5 years of age in the Islamic Republic of Iran. East Mediterr Health J 2000; 6(2-3): 238-245.
- Bhargava A, Gupta SD, Mangal DK, et al. Nutritional intervention among rural preschool: An evaluatory study. Indian J Pediat 1982; 49(400): 695-699.
- Bisai S, Mallick C. Prevalence of undernutrition among kora-Mudi children aged 2-13 years in Paschim Medinipur District, West Bengal, India. World J Pediatr 2011; 7(1): 31-36.
- De Onis M, Blossner M. The World Health Organization global database on child growth and mal nutrition: Methodology and applications. Int J Epidemiol 2003; 32(4): 518-526.
- 19. Corvalan C, Dangour AD, Uauy R. Need to address all forms of childhood malnutrition with a common agenda. Arch Dis Child 2008; 93(5): 361-362.
- 20. Ergin F, Okyay P, Atasoylu G and Beser E. Nutritional status and risk factors of chronic malnutrition in children under five years of age in Aydin, a western city of Turkey. Turk J Pediatr 2007; 49(3): 283-289.
- Senbanjo IO, Adeodu OO, Adjuyigbe EA. Low prevalence of malnutrition in a rural Nigerian community. Trop Doct 2007; 37(4): 214-216.
- 22. Insanaka R, Roederer T, Djibo A, et al. Reducing wasting in young children preventive supplementation: A cohort study in Niger. Pediatrics 2010; 126(2): e442-e450.

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