

## Prevalence of Malnutrition among Nursery School Children in Southeast of Iran

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**Abstract:** Malnutrition is a major public health problem in developing countries, which resulted in morbidity and mortality among children. The aim of study was to evaluate the prevalence of malnutrition among children aged 1-5 years old by new curves of WHO. A total of 385 children aged 1- 5 years attending nursery schools of Zahedan in southeast of Iran were enrolled into this cross-sectional study. Malnutrition was defined as underweight, stunting and wasting if the weight for age, height for age and weight for height indices were below -2 Z-score of the World Health Organization (WHO) Growth standards. Statistical analysis was performed using Epi-Info version 7. Results showed that the overall prevalence of underweight, wasting and stunting was 7, 6.2 and 15%, respectively. Although the overall prevalence was lower in boys, there was only a significant difference in the rate of stunting between boys and girls ( $P < 0.01$ ). The rate of malnutrition increased with child's age. Conclusion overall, the rate of stunting was significantly higher than the rates of underweight and wasting. Thus, further studies are needed to find the causes of height growth deficiency.

**Key words:** Malnutrition • Children • New WHO Standard

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### INTRODUCTION

Malnutrition is a major public health problem in developing countries, which affects the health systems and socio- economic status of the society and resulting in morbidity and mortality in children under- five years age [1-3]. It is estimated that nearly 20 million of children around the world, especially in South Asia and in Sub-Saharan Africa, suffer from severe acute malnutrition and about 5 million annual deaths of children under five years directly or indirectly are associated with malnutrition [2, 4]. The prevalence of malnutrition in the children under the age of 5 years in developing countries shows that about 31% are underweight, 38% are stunted

and 9% are wasted [5]. Over the past two decades, the prevalence of weight loss and underweight in Iranian children is dramatically high and is still one of the most common childhood disorders in Iran [6]. A national study performed on Iranian children by the Office of Community Nutrition Improvement in the Department of Health of the Ministry of Health and Medical Education in 1998, showed that 15.4, 10.9 and 4.9% of children < 5 years old in rural and urban areas in different provinces of the country had moderate and severe stunting, underweight and wasting, respectively [7]. The rate of malnutrition with various degrees in children under 5 years old in several cities and provinces of Iran has been reported in several studies [8-13]. Since, malnutrition in early life, leads to the

body slow growth, short stature, delayed mental development in children and also high risk of recurrent infections, resistance to treatment and reduced physical activity, thus growth monitoring in children is one of the important health services to find out their nutrition status [10]. In children, protein-energy malnutrition is considered by different conditions including weight for age (Underweight), height for age (Stunting) and weight for height (Wasting) that fall below -2.0 standard deviations of the NCHS and WHO growth charts [8]. So far, to check the children's growth, National Center for Health Statistics (NCHS) curves America were used, which were recommended for international use since the 1970s [14]. In 1993, World Health Organization (WHO) declared that the NCHS curves are not a good indicator for childhood growth. In 2006, WHO sets new standards for children under five years replaced the NCHS usual standards [15]. The aim of study was to evaluate the prevalence of malnutrition among children aged 1-5 years old attending nursery schools by new curves of WHO.

**Patients and Methods:** This cross sectional study was conducted among children aged 1- 5 years attending nursery schools in Zahedan -Sistan and Baluchistan province, located in South-east of Iran. Subjects were selected using multistage stratified random sampling during October 2015–January 2016. Based on a previous study [10] with a prevalence of stunting 20%, precision 0.05 and  $d=0.04$  the sample size of 385 subjects was calculated according to the following formula:  $n = [(Z^2 \cdot 1 - \alpha/2) \times P (1-P)] / d^2$ .

The study was approved by the ethics committee of Zahedan University of Medical Sciences (Code No: IR.ZAUMS.REC.2015.193) and informed consent and approval were given by the parents and the nursery school authorities where this study was carried out.

Children aged 1-5 years who attended nursery schools in Zahedan whose authorities gave consent were enrolled in this study. The children who were seriously ill and those who their parents did not give consent were excluded.

Age was determined by asking the date of the birth, or by examining the birth certificate. The children's weight was measured by a digital scale with precision rate of 0.1 kg with no shoes and minimum covering. A Stadiometer (Floor type model with sensitivity of 0.1 cm) was used for measurement of height. It typically consists of a vertical ruler with a sliding horizontal rod which is adjusted to rest on top of the head. The measurements were made by the trained nutrition students.

**Diagnostic Methods of Malnutrition:** The anthropometric data for each age group and sex were compared with new WHO standard of WHO [15]. This method is based on using Z-Score system to determine the grade malnutrition and measures all the three indices (Weight-for-age, height-for-age and weight-for-height) and expresses the results in terms of Z scores units. Underweight was indicated as weight-for-age, stunting as the height-for-age and wasting as the weight-for-height.

A Z-score of less than -3 was considered as severe malnutrition (i.e. stunting, wasting or underweight). Z-score between -2 and -3 as moderate malnutrition and also more than -2 was considered as normal [9, 15].

**Statistical Analysis:** Data entry was performed on Epi-Info, version 7. In order to analysis of data, the results of *Epi-Info* data file was exported into the Statistical Package for Social Sciences (SPSS) software, version 21 (Chicago IL). The results were expressed as mean  $\pm$  standard deviation. The data were compared by the chi-square test.  $P < 0.05$  was considered statistically significant.

## RESULTS

A total of 385 children aged 1- 5 years were enrolled in this study. Of these, 203 (52.7%) children were boys and 182 (47.3%) were girls. The distribution of children according to age and gender is demonstrated in Table 1. As shown in Figure 1, the sex adjusted rate of overall underweight, wasting and stunting among all children was 7, 6.2 and 15%, respectively. Girls showed higher percentage (9.3, 8.3 and 17%) of underweight, wasting and stunting as compared to boys (4.9, 4.5 and 13.3%), respectively. Regarding the grade of malnutrition, according to WHO Z-scores, 6 and 1% of children had moderate and severe underweight. The girls showed higher percentage (8.8%) of moderate underweight as compared to boys (3.4%) (Table 2). As well, 5.2 and 1% of children showed moderate and severe wasting. The prevalence of wasting was found higher in girls (7.7%) compared to boys (3%) (Table 3). However, no significant difference in prevalence of overall underweight and wasting was found between boys and girls ( $P = 0.058$ ,  $P=0.07$ , respectively).

The data in Table 4 shows that 10.1 and 4.9% of children had moderate and severe stunting. Severe stunting was significantly higher in boys (6.9%) as compared to girls (2.7%) ( $P<0.01$ ). Table 5 shows that the rate of malnutrition increased with child's age, so that the most rates of underweight (29.6%;  $P>0.05$ ), wasting (33.3%;  $P>0.05$ ) and stunting (29.3%;  $P<0.01$ ) were observed in children aged 5 years.

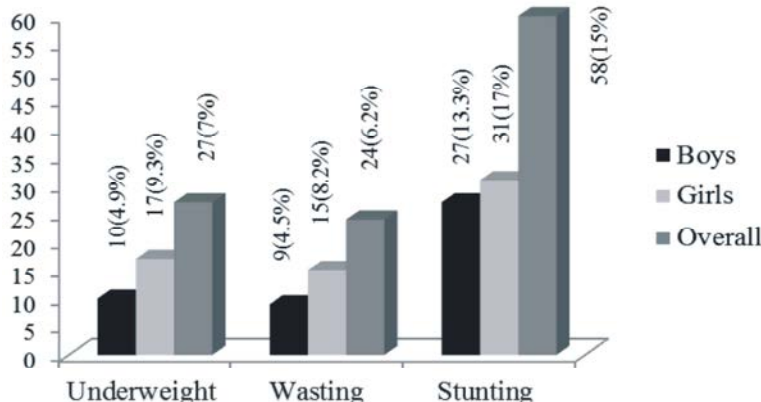


Fig. 1: Sex adjusted rate of underweight, wasting and stunting among studied children

Table 1: Distribution of studied children based on age and sex

Sex Age(years)	Boy (%)	Girl (%)	Combined
1.00	12 (5.9)	6(3.3)	18(4.7)
2.00	32(15.8)	24(13.2)	56(14.5)
3.00	33(16.3)	28(15.4)	61(15.8)
4.00	60(29.6)	48(26.4)	108(28.1)
5.00	66(32.5)	76(41.8)	142(36.9)
Overall	203(100)	182(100)	385(100)

$\chi^2=4.45$  P=0.06

Table 2: Sex adjusted rate of underweight among studied children

Sex Age(years)	Boys (%)	Girls (%)	Combined (%)
Normal	193 (95.1)	165(90.7)	358(93)
Moderate	7(3.4)	16(8.8)	23(6)
Severe	3(1.5)	1(0.5)	4(1)
Overall	203(100)	182(100)	385(100)

$\chi^2=5.58$  P=0.058

Table 3: Sex adjusted rate of wasting among studied children

Sex Age(years)	Boys (%)	Girls (%)	Combined (%)
Normal	194 (95.6)	167(91.8)	361(9.8)
Moderate	6(3)	14(7.7)	20(5.2)
Severe	3(1.5)	1(0.5)	4(1)
Overall	203(100)	182(100)	385(100)

$\chi^2=5.1$  P=0.07

Table 4: Sex adjusted rate of stunting among studied children

Sex Age(years)	Boys (%)	Girls (%)	Combined (%)
Normal	176 (86.7)	151(83)	327(84.9)
Moderate	13 (6.4)	26(14.3)	39(10.1)
Severe	14(6.9)	5(2.7)	19(4.9)
Overall	203(100)	182(100)	385(100)

$\chi^2=9.4$  P<0.01

Table 5: Age adjusted rate of kinds of malnutrition among studied children

Malnutrition Age(years)	Underweight (%)	Wasting (%)	Stunting (%)
1	3 (11.1)	0 (0)	7(12.1)
2	3 (11.1)	3(12.5)	9(15.5)
3	6(22.2)	6 (25)	12(20.7)
4	7(25.9)	7(29.2)	13(22.4)
5	8(29.6)	8(33.3)	17(29.3)
Total	27(100)	24(100)	58(100)
Pv	0.24	0.8	0.01

## DISCUSSION

This study showed that based on new WHO standard, 7, 6.2 and 15% of nursery school children in southeast of Iran were underweight, wasted and stunted, respectively.

Comparing current findings with data from the other countries in a similar age group of children (Aged under 5 years) demonstrated that 41 and 43% of children in Bangladesh were underweight and stunted [16]. The prevalence of underweight, wasting and stunting in Saudi children was found to be 8.2, 13.7 and 12.7%, respectively [17]. Several studies with a very large sample size conducted in Nairobi [18], Indonesia [19] and Libya [20] showed that 40, 38.4 and 20.7% of children were stunted. There was significant correlation between stunting and age, job [19], sex [18, 19] and education of mother and birth weight [18, 21].

Comparison of WHO standards with the NCHS/WHO reference in the studies of Dominican Republic, Bangladesh, United States and Europe [22] and Pakistan [23] revealed that the rates of underweight, stunting and wasting were higher when the WHO standards were used as reference.

Comparison of our results with some studies conducted in Iran showed that the prevalence of underweight, wasting and stunting was different with previous studies. A national survey conducted in the Islamic Republic of Iran in 1998 showed that according to the NCHS and WHO standards, the rates of underweight, wasting and stunting in Iranian children aged under 5 years were 10.9, 4.9 and 15.4% [24] and 9.5, 6.1 and 20.4%, respectively [25]. The rates of underweight and stunting in Iranshahr, located in the central region of Sistan and Baluchestan province, according to WHO standard was reported to be 9.8 and 11.1% [13]. A study conducted on

children under 6 years in Sistan and Baluchestan province revealed that based on NCHS and WHO standards; 21.1, 28.2, 19.4% and 32.1, 9.4 and 7.5% were underweight, wasted and stunted, respectively [8]. In three studies carried out in rural health centers of Birjand, south of Khorasan province, the rates of underweight, wasting and stunting, based on the NCHS and WHO standards, were 6.3, 0.8 and 9.8% respectively [10], 10.5, 10.8 and 9.3% [21] and 18.5, 3 and 40.1% [26]. The rates in Khorasan province, northeast of Iran, were 7.5, 4.4 and 12.5%, respectively [9].

It has been reported that the type of standard has considerable effect on the prevalence of nutritional indicators [17]. The prevalence of malnutrition with the new WHO standard can predict mortality better than NCHS standards [10, 17]. Thus, the variations of prevalence could be relevant to the assessment of malnutrition with type of standard. Also, according to other studies, it seems, sample size, low socio-economic status [17] geographical and racial differences [2] and other factors such as poverty, nutrient deficiencies, job and illiteracy of parents, low birth weight, insufficient food supply, poor dietary habits, birth grade, parasitic diseases and the implementation of healthcare programs and other facilities for this vulnerable group could also be contributory [8,13, 21].

Comparison of the current findings with previous studies in the various provinces and regions of the country indicates a relative improvement of nutritional status in children under 5 years old. However, the malnutrition still prevails on the other public health problems in Zahedan.

The rate of underweight, stunting and wasting separately for moderate and severe categories in our study showed that the prevalence of moderate and severe underweight were 6 and 1%, moderate and severe wasting were 5.2 and 1% with a slight girls preponderance. A similar research in Khorasan province showed that the rate of underweight and wasting in girls is higher than boys [9]. While, in two studies performed in Iranshahr and Sistan and Baluchistan province, the rate of moderate and severe underweight in boys was higher as compared to girls [8, 13].

The rates of moderate and severe stunting in the present study were 10.1 and 4.9% with a significant boy's preponderance. This finding is in keeping with previous studies [2, 13, 27, 28]. Whereas, Payandeh *et al.* [9] reported that the rate of stunting in girls was higher than boys [9]. Also an increasing in the rates of all three indexes of malnutrition were observed by age, in particular, the highest rate of stunting was shown in

children aged 5 years old in the current study. This finding is in accordance with several studies [2, 9]. Due to the low economic status and cultural poverty in some areas of Sistan and Baluchistan province, it seems that the increasing rate of malnutrition especially stunting in our study might be related to the low purchasing power of poor households to sufficient nutritious foods, inadequate energy and protein intake, inappropriate food habits because of insufficient nutritional awareness.

On the other hand, the high rate of stunting among children aged 5 years old compared to other age groups might be due to insufficient breastfeeding and complementary feeding practices in childhood, which contribute to inadequate intake of calorie and protein. However, we did not collect data to determine the impact of related factors on nutritional status.

The limitation of the study is that it was not designed to optimize the risk factors and consequences of malnutrition.

## CONCLUSIONS

Although, the prevalence of malnutrition in this study is lower than statistic reported in the previous studies, but due to the high prevalence of stunting, further studies to find out the causes of height growth deficiency and also implementation of intervention programs to increase nutritional knowledge of mothers is recommended.

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## REFERENCES

1. Musa, T.H., H.H. Musa, E.A. Ali and N.E. Musa, 2014. Prevalence of malnutrition among children under five years old in Khartoum State, Sudan. *Pol. Ann. Med.*, 21(1): 1-7.
2. Manyike, P.C., J.M. Chinawa, A. Ubesie, H.A. Obu, O.I. Odetunde and A.T. Chinawa, 2014. Prevalence of malnutrition among pre-school children in, South-east Nigeria. *Ital. J. Pediatr.*, 40: 75.

3. Ubesie, A.C., N.S. Ibeziako, C.I. Ndiokwelu, C.M. Uzoka and C.A. Nwafor, 2012. Under-five protein energy malnutrition admitted at the University of Nigeria Teaching Hospital, Enugu: a 10 year retrospective review. *Nutrition J.*, 11(43): 1-7.
4. Consortium of Universities for Global Health Report, 2015. Acute Malnutrition. Available at: <http://www.worldhunger.org/articles/Lear>. Assessed on 01/02/2015.
5. Müller, O. and M. Krawinkel, 2005. Malnutrition and health in developing countries. *CMAJ*, 173: 279-86.
6. Ziaee, V., R. Keleshadi, G. Ardalan, R. Gheiratmand and R. Majdzadeh, 2006. Physical activity in Iranian students, Caspian study. *Iran. J. pediatr.*, 16(2): 157-64.
7. Sheykholeslam, R., M. Kimiagar and H. Malek Afzali, 2003. Result growth pattern in children in Iran 1998. Tehran: National Committee of Kids Nutritional. *Hakim. Res. J.*, 6(1): 1-6 [Persian]
8. Karajibani, M., M. Shaykhei, F. Montazerifar and M. Eftekharenia, 2014. Prevalence of Malnutrition in Children under 6 Years in Sistan and Baluchestan Province, Iran. *Zahedan J Res Med Sci.*, 16(8.): 20- 4.
9. Payandeh, A., A. Saki, M. Safarian, H. Tabesh and Z. Siadat, 2013. Prevalence of malnutrition among preschool children in northeast of Iran, a result of a population based study. *Glob. J. Health. Sci.*, 22:5(2): 208-12.
10. Fesharakinia, A. and G. Sharifzadeh, 2013. Prevalence of malnutrition in under 5-year old children in Birjand city in 2011. *J Birjand Uni Med Sci*, 20(1): 77-84. [Persian]
11. Ghassemi, H., G. Harrison and K. Mohammad, 2002. An accelerated nutrition transition in Iran. *Public. Health. Nutrition.*, 5(1A): 149-55.
12. Sayari, A., R. Sheykholeslam, M. Naghavi, Z. Abdollahi, F. Kolahdooz and E. Jamshid Beygi, 2001. Surveying different types of malnutrition in children under 5 years old in urban and rural areas, Iran. *Pejouhandeh.*, 5: 409-16.
13. Mohammadinia, N., H.S. Poor, M. Rezaei and N.H. Khayat, 2012. The Prevalence of Malnutrition among children under 5 years old referred to health centers in Iranshahr during 2010-2011. *JOHE.*, 1(3): 139-49.
14. National Center for Health Statistics. Growth charts. US Dept. of Health, Education and Welfare, Public Health Service, Health Resources Administration, Rockville MD 1976: 3 (HRA76 - 1120, 25).
15. World Health Organization (WHO), 2006. Multicentre Growth Reference Study Group. WHO Child Growth Standards: Length/height-for-age, weight for- age, weight-for-length, weight-for-height and body mass index-for-age: Methods and development. Geneva: World Health Organization.
16. Ahmed, T., M. Mehruz, S. Ireen, A.M. Ahmed, S. Rahman, M.M. Islam, N. Alam, M.I. Hossain, S.M. Rahman, M.M. Ali, F.P. Choudhury and A. Cravioto, 2012. Nutrition of children and women in Bangladesh; Trends and directions for the future. *J. Health. Popul. Nutr.*, 30(1): 1-11.
17. El Mouzan, M.I., P.J. Foster, A.S. Al Herbish, A.A. Al Salloum, A.A. Al Omar and M.M. Qurachi, 2010. Prevalence of malnutrition in Saudi children: a community -based study. *Ann. Saudi. Med.*, 30(5): 381-5.
18. Abuya, B.A., J. Ciera and E. Kimani-murage 2012. Effect of mother's education on child's nutritional status in the Slums of Nairobi. *BMC. Pediatr.*, 12: 80.
19. Ramli Agho, K.E., K.J. Inder, S.J. Bowe, J. Jacobs and M.J. Dibley, 2009. Prevalence and risk factors for stunting and severe stunting among under-fives in North Maluku province of Indonesia. *BMC. Pediatrics.*, 9(1): 64.
20. El Taguri, A., I. Betilmal, S.M. Mahmud, A. Monem Ahmed, O. Goulet, P. Galan and S. Hercberg, 2009. Risk factors for stunting among under-fives in Lybia. *Public. Health. Nutr.*, 12(8): 1141-9.
21. Ramazanpour, M., A. Akaberi, E. Khoshnoud Ostad and H. Shoraka, 2013. Investigation into malnutrition prevalence rate and effective factors on under five - year - old children in Maneh - Semelghan city (2012-2013). *J North Khorasan Uni Med Sci.*, 5(2): 365-73. [Persian]
22. de Onis, M., A.W. Onyango, E. Borghi, C. Garza and H. Yang, 2006. WHO Multicentre Growth Reference Study Group. Comparison of the World Health Organization (WHO) Child Growth Standards and the National Center for Health Statistics/WHO international growth reference: implications for child health programmes. *Public. Health. Nutr.*, 9: 942-7.
23. Nuruddin, R., M.K. Lim, W.C. Hadden and I. Azam, 2009. Comparison of estimates of under-nutrition for pre-school rural Pakistani children based on the WHO standard and the National Center for Health Statistics (NCHS) reference. *Public Health Nutr.*, 12(5): 716-22.

24. Sheikholeslam, R., M. Naghavi and Abdollahi Zea, 2008. Current Status and the 10 Years Trend in the Malnutrition Indexes of Children under 5 years in Iran. *Iran. J. Epidemiol.*, 1(4): 21-8.
25. World Health Organization (WHO), 2011. Global Database on Child Growth and Malnutrition. [Updated 2011 January 14]. Available from: <http://www.who.int/nutgrowthdb>. January 14, 2011]
26. Alavi Naeini SM. The study of the prevalence of malnutrition and its related factors among zero to 59 month old children in Birgand rural areas. *Tehran Univ Med J.* 2001; 59 (1) :99-103 [Persian]
27. Sayari, A., R. Sheykholeslam, M. Naghavi, Z. Abdollahi, F. Kolahdooz and E. Jamshid Beygi, 2001. Surveying different types of malnutrition in children under 5 years old in urban and rural areas, Iran. *Pejouhandeh.*, 5: 409-16.
28. Henry, W., N. Anne, P. Stefan, K.T. James and T. Thorkild, 2007. Boys are more stunted than girls in Sub-Saharan Africa: a meta-analysis of 16 demographic and health surveys. *BMC. Pediatr.*, 7: 17.