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Prevalence of Malnutrition in Children under 6 Years in Sistan and Baluchestan Province, Iran

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Abstract

***Background*:** The present study was conducted in rural area of Sistan and Baluchestan province, south-east of Iran with aim of determine the prevalence of underweight, stunting, wasting, overweight and obesity among children.

***Materials and Methods*:** One thousand five hundred seventy Children were selected from all children less than 6 years covered by healthy and treatment centers of rural area in Sistan and Baluchestan province. Body weight and height were measured using standard methods. Determination of malnutrition performed based on WHO, National Center for Health Statistics and Center for Disease Control and Prevention (NCHS and CDC) standard. The indices nutritional status was assessed by Z- Score.

***Results*:** The result showed that, based on NCHS and WHO standard: 21.1% and 19.4%, 28.2% and 32.1%, 7.5% and 9.4% of children were underweight, stunted and wasted respectively. The peak of malnutrition based on stunting was more than underweight and wasting. According to CDC standard, the prevalence of underweight, overweight and obesity was 27.8%, 4.2% and 4.1% respectively. The most rate of overweight and obesity was 7.1% and 5% in children aged 3 years using CDC cut-off and also lowest rate of overweight and obesity were 1.5% and 0% in children aged 5 years.

***Conclusion*:** This study revealed, underweight, stunting and wasting represents different processes of malnutrition which have different risk factors. However, it might be replaced by overweight as children grow to adolescence. Nevertheless, overweight and obesity are not major problem in the children.

Introduction

Protein–energy malnutrition (PEM) has been known as "development prohibiting syndrome". It include many disorders; failure to thrive (FTT), retardation in mental and physical, reduction of cognitive and social development, resistance to infection and on physical activity in developing countries [1, 2]. Malnutrition increases, duration, severity, complications and mortality of other diseases [3]. The nutrition transition in Iran is occurring rapidly and obesity is an emergency problem, particularly in urban areas. However, malnutrition manifested by underweight, stunting, and wasting in preschool children is still a significant problem [4]. Malnutrition and growth failure are the most problems in children which lead to half of children's death in developing countries [5].

Malnutrition is characterized by different condition such as underweight, stunting, and wasting, marasmus and kwashiorkor [6]. According to national survey of Iran in 1995, the results showed 15.0% of boys and 16.3% of girls less than 5 years to be moderately or severely malnourished, based on weight for age index [2]. The last civil study in Iran in 1998 showed that 15.4% and 10.9% of children under 5 years suffer from stunting and underweight respectively. Although, if weak cases are studied, the problem will be more substantial [7]. In parallel to, over the last 20 years developing countries have experienced an increase in the incidence of overweight and obesity as a consequences. But, it seems problem of malnutrition and micronutrient deficiencies still is the major problem in this area.

Sistan and Baluchestan province is wide and located in south-east of Iran. Although, there are many efforts and programmes to perform for deprivation elimination such as economical, nutritional and social supporting, improvement in living standards and quality of life and provide facilities in this region. It seems there are still nutritional problems in this area. Especially, children which suffered from under nutrition [2, 8]. Nutritional status development requires reliable data on the anthropometric indicators in the study population.

The present study was undertaken to determine the prevalence of underweight, stunting, and wasting and overweight among children under 6 years children in Sistan and Baluchestan province, south-east of Iran.

Materials and Methods

In this a descriptive-analytical study, nutritional status of 1570 children were assessed. In Sistan and Baluchestan

province, south-east of Iran. Children 0-6 years were selected using multistage stratified random sampling. Based on a pilot study, with a prevalence of underweight 20%, precision 0.05 and d=0.02 the sample size of 1750 subjects was calculated according to the following formula: $n= [(Z^2 1-\alpha/2)\times P(1–P)]/d^2$.

A total 160 villages were selected based on the size of the population in each of the 8 cities and 1000 rural which located in province. In rural area, we selected 160 clusters (villages) which children under 5 years were selected randomly. The health house in villages usually covering the population of every area. Besides, health centers connected to the district health centers.1570 children (boys=785 and girls=785) was selected between 1-September to 30- November 2010 from all children under 6 years covered by healthy and treatment centers of rural area in Sistan and Baluchestan province both family children's health record. Body weight and height were measured using standard methods by educated health workers.

The child's weight was measured either a tray scale or a standing scale with measuring ruler for height. Body weight was measured with precision rate of 0.1 kg with no shoes and minimum covering. A box–type measuring instruments was used to determine the supine height of those under 2 years of age from head to heel with precision rate of 0.5 cm. For elder children, body weight and height were measured to the nearest 0.2 kg and 0.5 cm respectively. All the scales and height measures were the same in all researching. Determinations of underweight, stunting, and wasting were performed based on the classification of WHO and NCHS.

The indices nutritional status was assessed by Z-Score. Under nutrition was defined as less than 2 standard deviation (2SD) of weight-for-age; height-for-age and weight-for-height Z-Scores. Overweight and obesity defined as higher than+2SD based on weight-for-height [9]. Nutritional status of children was determined as mild, intermediate and severe malnutrition according to WHO classification standard [9]. Therefore children with Z-Score in (-1 SD to - 2SD) from the mean were considered as mildly underweight, (-2 SD to -3SD) as intermediately underweight, and more than -3 SD severely underweight. Similarly, according to following classification nutritional status was assessed as wasting (weight for height) and also stunting (height for age). Age, sex-specific and body mass index (BMI) proposed by CDC was used to define underweight, overweight and obesity percentile [10]. Wasting, normal, overweight and obesity were defined as age adjusted BMI less than 5th percentile, 85th to less than 95th and equal to or greater than 95th percentile respectively [10, 11].

Statically analysis: The data were analyzed by using SPSS-11. Data in each group were summarized as frequencies and 95% confidence intervals (CI) of children. Descriptive statistics of the data was analyzed using chi–square test at the significant level $p<0.05$. All the parents gave written consent for participation in the present study. They were also free to leave the study any time. Besides, this study was approved by health deputy of Zahedan University of Medical Sciences, Iran.

Results

One thousand five hundred seventy children aged 0-6 years were controlled in this study. All children were selected from rural area. The most children of study was less than one years (Table 1). With respect to underweight, according to NCHS and WHO standard 16.9% and 13.8% had intermediate malnutrition respectively. Based on following standards 4.2% and 5.6% were sever underweight respectively (Table 2). Overweight was more prevalent the boys than the girls. According to underweight, there was no significant difference based on NCHS and WHO standards in the children ($p=0.05$). However, the prevalence of stunting in children under 6 years was higher than underweight. Table 3 compares the stunting according to NCHS and WHO cut offs. The prevalence of stunting was 16.8% and 17.7% respectively. These data were also similar. According to stunting, the nutritional status of the children studied was unfavorable.

The rate of sever stunting using NCHS and WHO standards were 11.4% and 14.4% respectively (Table 3). There was no significant difference among boys and girls regarding this. However, according to stunting, there was significant difference based on NCHS and WHO standards in the children ($p=0.0001$). But there was no significant difference between boys and girls according to stunting. Table 4 shows the prevalence of malnutrition, assessed by weight for height index and defined as wasting below the NCHS and WHO standards. The rate of wasting based on mentioned indices was the same (6.4% vs 7.0%). According to NCHS and WHO cut–offs, the prevalence of mild malnutrition was 21.7% and 18.3% respectively (Table 4).

According to stunting, there was significant difference based on NCHS and WHO standards in the children ($p=0.0001$). The prevalence of underweight, stunting and wasting (< - 2 Z- Score) calculated using both references is shown in table 5. The peak of malnutrition based on stunting was more than underweight and wasting (Table 5). It was estimated the prevalence underweight (27.8%), overweight (4.2%), and obesity (4.1%) based on CDC standard respectively (Table 6). The highest rate of underweight was observed in children aged 5 years (30.9%). The most rates of overweight and obesity was also observed 7.1% and 5% in children aged 3 years using CDC cut-off. The lowest rate of overweight and obesity were 1.5% and 0% in children aged 5 years (It has not been shown).

Table 1. Frequency distribution of children less than 6 years

Sex Age groups	Girls CI:95% N(%)	Boys CI:95% N(%)	Total CI:95% N(%)
<1years	348 (44.3)	326 (41.5)	674 (42.9)
1-2 years	180 (22.9)	193 (24.6)	373 (23.7)
2-3 years	94 (12)	104 (13.2)	198 (12.6)
3-4 years	73 (9.3)	67 (8.5)	140 (8.9)
4-5 years	57 (7.3)	60 (7.6)	117 (7.4)
5-6 years	33 (4.2)	35 (4.5)	68 (4.3)
Total	785 (100)	785 (100)	1570 (100)

Table 2. Prevalence of underweight among children less than 6 years

Sex	Girls CI:95%		Boys CI:95%		Total CI:95%	
Underweight	NCHS N(%)	WHO N(%)	NCHS N(%)	WHO N(%)	NCHS N(%)	WHO N(%)
Severe	41 (5.2)	41 (5.2)	25 (3.2)	47 (6)	66 (4.2)	88 (5.6)
Moderate	115 (14.6)	96 (12.2)	151 (19.2)	121 (15.4)	266 (16.9)	217 (13.8)
Mild	258 (32.9)	222 (28.3)	292 (37.2)	246 (31.3)	550 (35)	468 (29.8)
Normal	337 (42.9)	357 (45.5)	292 (37.2)	311 (39.6)	629(40.1)	668 (42.5)
Missing	34 (4.3)	69 (8.8)	25 (3.2)	60 (7.6)	59 (3.8)	129 (8.2)
Total	785 (100)	785 (100)	785 (100)	785 (100)	1570 (100)	1570 (100)

Table 3. Prevalence of stunting among children less than 6 years

Sex	Girls CI:95%		Boys CI:95%		Total CI:95%	
Stunting	NCHS N(%)	WHO N(%)	NCHS N(%)	WHO N(%)	NCHS N(%)	WHO N(%)
Severe	94 (12)	108(13.8)	85 (10.8)	118 (15)	179 (11.4)	226 (14.4)
Moderate	124 (15.8)	139 (17.7)	139 (17.7)	139 (17.7)	263 (16.8)	278 (17.7)
Mild	212 (27)	182 (23.2)	231 (29.4)	211 (26.9)	443 (28.2)	393 (25)
Normal	309 (39.4)	279 (35.5)	291 (37.1)	244 (31.1)	600 (38.2)	523 (33.3)
Missing	46 (5.9)	77 (9.8)	39 (5)	73 (9.3)	85 (5.4)	150 (9.6)
Total	785 (100)	785 (100)	785 (100)	785 (100)	1570 (100)	1570 (100)

Table 4. Prevalence of wasting among children less than 6 years

Sex	Girls CI:95%		Boys CI:95%		Total CI:95%	
Wasting	NCHS N(%)	WHO N(%)	NCHS N(%)	WHO N(%)	NCHS N(%)	WHO N(%)
Severe	6 (0.8)	15 (1.9)	11 (1.4)	23 (2.9)	17 (1.1)	38 (2.4)
Moderate	36 (4.6)	42 (5.4)	65 (8.3)	68 (8.7)	101 (6.4)	110 (7)
Mild	171 (21.8)	148 (18.9)	170 (21.7)	140 (17.8)	341 (21.7)	288 (18.3)
Normal	453 (57.7)	412 (52.4)	440 (56.1)	404 (51.5)	893 (56.9)	816 (52)
Missing	119 (15.2)	168 (21.4)	99 (12.6)	150 (19.1)	218 (13.9)	318 (20.3)
Obese	42 (5.4)	44 (5.6)	29 (3.7)	39 (5)	71 (4.5)	83 (5.3)
Total	785 (100)	785 (100)	785 (100)	785 (100)	1570 (100)	1570 (100)

Table 5. Nutritional status of children less than 6 years

Nutritional Status (CDC)	Girls CI:95% N(%)	Boys CI:95% N(%)	Total CI:95% N(%)
Underweight	69 (26.8)	77 (28.9)	146 (27.8)
Normal	168 (65.4)	165 (62)	333 (63.7)
Overweight	13 (5)	9 (3.4)	22 (4.2)
Obese	7 (2.7)	15 (5.6)	22 (4.1)

Table 6. Nutritional status of children less than 6 years

Sex	Girls CI:95%		Boys CI:95%		Total CI:95%	
Nutritional Status	NCHS N(%)	WHO N(%)	NCHS N(%)	WHO N(%)	NCHS N(%)	WHO N(%)
Underweight	156 (19.9)	137 (17.5)	176 (22.4)	168 (21.4)	332 (21.1)	305 (19.4)
Stunting	218 (27.8)	247 (31.5)	224 (28.5)	257 (32.7)	442 (28.2)	504 (32.1)
Wasted	42 (5.4)	57 (7.3)	76 (9.7)	91 (11.6)	118 (7.5)	148 (9.4)

Discussion

This study revealed that, based on NCHS and WHO standard: 21.1% and 19.4%, 28.2% and 32.1%, 7.5% and 9.4% of children under 6 years in Sistan and Baluchestan province were underweight, stunted and wasted respectively. It was observed 4.5 % and 5.3% of them were overweight and obese which expressed based on weight for height > + 2SD of the WHO and NCHS child growth standards median. Comparison of our results with similar studies showed that the prevalence of overweight and obesity in this study was lower than in other part of the Islamic Republic of Iran. Nojomi et al. showed that 13.9%, 20.3%, and 4.9% of children under 5 year were underweight, stunted and wasted respectively [12]. According to weight-for-age the national survey in Iran showed 15% of boys and 16.3% of girls under 5 year were moderate and sever malnourished [2]. In the study carried out in Birjand, south of Khorasan province, Iran the prevalence of underweight, stunting, and wasting were 41.3%. 45% and 32.2% respectively [13]. The Anthropometric Nutritional Indicators Survey (ANIS) in 1998 reported, the rates of underweight, stunting, and wasting were 22.2%, 34.5% and 7.5% respectively [14]. Several studies have been done in different areas of Iran [12, 15, 16]. But, it seems, despite the rising trend of health and therapeutic services and other facilities for different vulnerable groups in the country. Problems of malnutrition and micronutrient deficiencies still dominate the public health nutrition outline in this area. In another study has been reported, major problem was underweight in the teenager girls in Sistan and Baluchestan province, Iran [17]. Several factors such as poverty, nutrient deficiencies, illiteracy, poor diet, infection, parasitic disease are played role in the prevalence of malnutrition. The results showed there was malnutrition in different degrees from mild to severe and overweight and obesity are not a major problem in the children. The concepts of wasting and stunting were expressed two different forms of protein-energy malnutrition (PEM) in childhood. Wasting defined as an acute situation indicating recent weight loss. Stunting referred to chronic malnutrition [18]. It is probable the baby was born underweight because of her mother was stunted or her nutritional status was not favorable. Deprivation in feeding and care that impair growth in the critical first years which leading to poor school performance and dropping out [7, 16]. The present study was conducted in the children covered by the health house in study area. The health house is the basic level of health service in the rural area which health workers deliver health care services. According to growth monitoring program, all children covered by the health house are visited once a month in their first year of life, two times in their second year, every 3 months in their third year and every 6 months during their fourth, fifth and sixth years. The findings of recent study showed the rate of malnutrition has been decreased in the percentage of children. It seems, the primary health care (Ph.C) can be improved the health status of the most number of people in the least time [19]. However, other services were performed in this area such as nutritional programmers which delivering comprehensive services for vulnerable groups. The results showed, there was malnutrition from acute to chronic of underweight, stunting, and wasting. It was observed, positive correlations between stunting and wasting in Asia and the Eastern Mediterranean [18]. On the other hand, according to NCHS and WHO standards prevalence of mild and moderate underweight (35% and 29.8%, 16.9% and 13.8%), mild and moderate stunting (28.2% and 25%, 16.8% and 17.7%), and mild and moderate wasting (21.7% and 18.3%, 6.4% and 7%) respectively. Stunting is the result of long-term nutritional deprivations and wasting as a consequence of insufficient food intake or infectious disease [7, 8]. According to the study carried out on children under 5 years in Bam, south east of Iran, prevalence of medium and acute underweight, medium and acute stunting, medium and acute wasting were 15.2%, 8.9% and 5.6% respectively [20]. According to acute deprivation of living facilities, poverty, droughts and improper nutrition in Sistan and Baluchestan province are the reasons why the results of this study are different from those of similar studies [15, 16, 20]. In the present study, based on WHO standard it was observed difference between the boys and girls regard to prevalence of underweight, stunting, and wasting. However, the percent of malnutrition almost was more in boys. According to other studies, it seems, rural areas as compared urban areas is more at risk of nutritional deficiencies, low income, illiteracy, low education and other facilities [7, 13, 17, 21]. Totally, there are many factors which contribute to preexistence of malnutrition such as inadequate access to a safe water supply and poor sanitation and environmental contamination.

This study showed based on CDC standards, 4.2% and 4.1% of children were overweight and obese respectively. The prevalence of overweight in two sexes was almost similar, but obesity in girls was more than boys (5.6% vs 2.7%). This result approved nutrition problem based on under nutrition which before mentioned. Maddah et al. reported, prevalence of overweight in girl children was more than boys. Nevertheless, underweight is still the main nutritional problem in children [22]. In another study has been reported, the frequency of underweight in high school girls in Sistan and Baluchestan province was higher than most countries on other parts of Iran [17]. Iran is the category of countries which has moderate levels of overweight/obesity co-exist with moderate levels of under nutrition in specific population and age groups [23]. There is considerable imbalance in food consumption with low nutrient density characterizing diets at all income levels, over-consumption evident among more than a third of households in Iran [4]. This study revealed that the most important of nutritional problems is underweight, stunting and wasting in the children. However, it might be replaced by overweight as children grow to adolescence. Further research is needed to recognize the dietary and other factors of nutritional status

in this region of Iran. Because of these factors are better known.

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Authors' Contributions
Mansour Karajibani conceptualized, designed the study, wrote and revised the manuscript and submitted. Mahdeyeh Shaykhei and Monir Eftekharenia coordinated and supervised data collection and statically analysis. Farzaneh Montazerifar helped in the initial analysis, drafted the initial manuscript and approved.

Conflict of Interest
The authors declare no conflict of interest.

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