

## Nutritional Status and Related Factors in Children, Bandar Turkmen District, Iran

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Article information	Abstract
<p>Article history: Received: 19 June 2011 Accepted: 14 Sep 2011 Available online: 9 Apr 2013 ZJRMS 2014 Aug; 16(8): 29-33</p> <p>Keywords: Malnutrition Obesity Children</p> <p>*Corresponding author at: Nursing Research Center, Research and Technology Deputy, Golestan University of Medical Sciences, Gorgan, Iran. E-mail: ebrahimzadeh1358@gmail.com</p>	<p><b>Background:</b> Prevalence of protein-energy malnutrition (PEM) is one of the important problems of third-world countries including Iran. This study assessed nutritional status and some related factors among children aged 0-5 years in Bandar Turkmen district.</p> <p><b>Materials and Methods:</b> In this cross-sectional study, 616 children aged less than 5 years were selected with stratified random sampling. Malnutrition was defined as &lt;-2 SD National Center for Health Statistics (NCHS) reference (weight for age, weight for height and height for age respectively). Obesity was defined as &gt; +2 SD NCHS reference. Data were collected by interview with mothers and were analyzed with SPSS-11.5 software.</p> <p><b>Results:</b> In this study, prevalence of underweight, wasting and stunting and obesity were 3.7, 3.9, 7 and 6% respectively. Exclusively breastfeeding, mother's BMI, mother's weight and parental educational and economic status had significant correlation with children's PEM (<math>p&lt;0.05</math>). Birth weight &lt;2500 g and &gt;4000 g (<math>p=0.031</math>), breast feeding duration &lt;18 months (<math>p=0.017</math>), mother's present age <math>\geq 37</math> years (<math>p=0.039</math>), mother's delivery age &gt;30 years (<math>p=0.043</math>) and formula or cow's milk plus breast feeding up to 6 months old (<math>p=0.018</math>) had significant correlation with children's obesity. In multivariate analysis on logistic regression, mother's nutritional knowledge (OR=11.22, <math>p=0.001</math>) was most important risk factor for PEM. Exclusively breast feeding up to 6 months of age rather than formula or cow's milk plus breast feeding, reduced 2.45 times obesity risk (<math>p=0.019</math>).</p> <p><b>Conclusion:</b> We conclude that breast feeding at first 6 months of age, longer breast feeding duration and pregnancy in lower than 30 years of age reduce risk of child nutritional status.</p> <p>Copyright © 2014 Zahedan University of Medical Sciences. All rights reserved.</p>

### Introduction

Protein malnutrition-energy, due to linear rapid growth, rapid growth of the brain and the immune system of children [1], that can lead to impaired physical growth and even infant mortality [2]. In today's world, because of poor nutrition 40,000 children die daily [3] in the first years live malnutrition is seen in almost all developing countries, including Iran [4]. One third of children under 5 years of Iranian exposed to moderate or severe protein malnutrition-energy [5], so after acute respiratory infection and diarrhea, malnutrition is the third cause of infant mortality in Iran [6]. Meanwhile, in recent years, obesity which many of disease is the direct and indirect effects of it has expanded dramatically in children and adolescents [7, 8]. Complexity and multifaceted nature of malnutrition has led to the despite continuous efforts to establish and optimize health network, improve the capacity of food production, education and economic access to food sources continuous and increasing a lot of protein-energy malnutrition still to be seen [2] and due to lack of systematic applicable approaches in the field of child care, unfortunately prevention and treatment are no success [9]. Given the pivotal role to identify the causes of malnutrition in the prevention and control of other

diseases [2], and to identify the type, status and local causes of problems in each area, the characteristics of cultural and economic region should be interested [4].

According to the ever, nutritional status of children under 5 years in the port city of Bandar Turkmen has not been considered separately. However, according to the Ministry of Health and Medical Education study in 1998, the prevalence of stunting, underweight and wasting in children under 5 years of Golestan province, 11.1, 2.4 and 0.4% respectively [9]. Lashkar-Blooki et al. reported that prevalence of stunting, underweight and wasting in children under 2 years old is 7.1, 3.39 and 3.32% [9]. Since a study on the prevalence of obesity in the country is not for children under 5 years, so this study aim is nutritional status and factors in children under 5 years in Bandar Torkaman city.

### Materials and Methods

In this cross-sectional study, sampling method, was stratified random therefore proportional to the volume. First, based on 5% incidence likely of protein malnutrition-energy, 95% confidence interval and 2%

error, the number of samples needed was 456 patients randomly. Then because the relative performance of random sampling compared to stratify is a maximum of 1.35, the final sample size was 616. Then on the list under 5 years population of Turkmen city and the proportion of the urban and rural population under 5 years younger than 5 years in the city, the sample size required in each town and village (all three in the city and 21 villages of 23 villages of Bandar Turkmen), were selected randomly. Malnutrition including stunting (low height for age), wasting (low weight for age) and wasting (low weight for height) was defined based on the -2 standard deviation of reference population. Child and maternal weight without shoes and with minimal clothing was measured by digital seca scale made in the USA ordered by World Health Organization, with accuracy of 0.1 kg. All scales used in measuring children's weight were tested at the beginning and at work with specific weights. Height of lying in children under two years and standing height for children over two years were measured by using the horizontal plane of height and carefully graded metal bar with accuracy of 0.1 cm. Mother's body mass index ( $\text{kg/m}^2$ ) is calculated by Weight (Kg) divided the square of height (m). Then some form of child and mother and some features of the economic-social was form completed by the question of the mother's household community. Other information was obtained from medical records of family health.  $\chi^2$  and Fisher's exact tests for qualitative correlation between the independent variables and the dependent variables of nutritional status and Pearson's test on quantitative variables was selected, finally to identify the most important variables associated with nutritional status, logistic regression analysis with 95% confidence level ( $p < 0.05$ ) in soft SPSS-11.5 software was used.

## Results

Among the 616 children studied, the prevalence of stunting, wasting, underweight and overweight children surveyed, 7, 3.9, 3.7 and 6% respectively. Area of residence (urban or rural) and gender differences in the prevalence of malnutrition among children- no significant effect (Table 1). Babies's birth weight revealed a direct correlation with the score rate of height for age ( $p=0.001$  and  $r=0.17$ ), weight for height ( $p=0.009$  and  $r=0.105$ ) and weight-for-age ( $p=0.001$  and  $r=0.182$ ), no significant effect on wasting, underweight and stunting was observed. Prior and subsequent to the child's birth, birth order, whether or not with diarrhea or respiratory illness, age at onset, type of food supplement, current age and maternal age at birth of child, mean did not significant effect of the prevalence of malnutrition. Children who were breastfed exclusively for 6 months, compared with cow's milk formula had been less severe stunting ( $p=0.036$ ). Pearson test showed statistically significant negative correlation between duration of breastfeeding and weight-for-age and weight-for-height ( $p=0.01$  and  $r=0.17$ ,  $p=0.01$  and  $r=0.214$ ) and about height for age was showed positively correlated ( $p=0.022$  and  $r=0.225$ ), but according to the Fisher's Exact test duration of

breastfeeding in healthy and malnourished children was no significant difference. Direct correlation was revealed between birth weight children with weight-for-height z-score points ( $p=0.009$  and  $r=0.105$ ) so that birth weight less than 2500 g or more than 4000 g increased prevalence of obesity ( $p=0.031$ ). Based on Fisher's exact test, previous birth interval and child obesity was a significant relation ( $p=0.012$  and  $F=12.074$ ). Fisher's exact test, showed significant effect ( $p=0.032$ ) of maternal BMI on prevalence of underweight. Based on  $\chi^2$  test, the type of feeding up to 6 months of age and the prevalence of obesity was correlated ( $p=0.006$ ). Pearson test showed negative correlation ( $p=0.01$  and  $r=-0.214$ ) between duration of breastfeeding and weight for height, so that lactation length less than 18 months compared with length more than 18 months increased obesity significantly ( $p=0.017$ ). Interestingly, with increasing maternal BMI and reach into the  $30 \text{ kg/m}^2$ , the prevalence of obesity in children is low and over this border, stunting among children is increased. If the maternal age  $\pm 30$  years and her current age  $\pm 37$  years is considered, direct relation ( $p=0.036$ ,  $F=4.418$  and  $p=0.028$ ,  $F=0.087$ ) is showed with incidence of childhood obesity. According to table 2, children of mothers with a moderate and good nutrition knowledge and nutritional awareness than children of mothers with nutrition little knowledge and awareness had 5.74 and 11.33 fold lower odds of stunting, respectively. Regular child refer to the health center compared with irregular child refer had 2.43 and 1.83 times low risk of stunting and LBW incidence.

## Discussion

The results showed that 7% of children suffer from stunting, 3.7% with underweight, and 3.9% are suffering from wasting. Obesity prevalence was 6% because in 2.3% of children are under -2 standard deviations (SD) and about 2.3% of children are above +2 SD [9]. Therefore we can say that prevalence of four indicators mentioned above (stunting, underweight, wasting and obesity) in Bandar Turkmen is more than reference population. It should be noted that stunting as chronic malnutrition, is the main problem. Lashkar-Blooky et al. in Golestan province reported that the prevalence of stunting, underweight and wasting in children under 2 years is 7.1%, 3.39% and 3.32% respectively [9]. According to the Ministry of Health and Medical Education study, the prevalence of stunting, underweight and wasting in children under 5 years of Golestan province, 11.1%, 2.4% and 0.4% respectively [9]. Sadat et al. in the city of Kashan, the prevalence of stunting, underweight and wasting in children under 5 years attending health care centers are 5.3%, 1.46%, and 1% respectively [10]. Better nutritional status in this study compared to our study may be due to better economic status in Kashan city (Isfahan province), than of Bandar Turkman city (Golestan province). Soheiliazad reported that, stunting, underweight and wasting of children under 3 years in Nahavand city is 12.3%, 3% and 2.7% respectively [1]. Higher stunting in this study than our

study can be due to poor agricultural and economic status of this area and mountain region in past. The difference between the age groups Soheili study may be effective on differences in the incidence of malnutrition. In our study, sex of child had no significant effect on malnutrition. Rymaz study in Savojbolagh city and Kalantari et al. study in Amol villages and some other studies also showed the no effect of child sex on malnutrition [11-16]. In our study, no significant difference in prevalence of underweight, wasting and stunting among both boys and girls can reflect changing family's attitudes towards gender and non-discrimination between boys and girls are receiving food. In this study, the birth weight of children showed a direct relationship with height for age z-score. But no significant effect on wasting, underweight and stunting was observed. Not affecting the birth weight can be due to the low number of birth weights with birth weight less than 2,500 g (4.7%). In the case-control study of Kalantari, birth weight children in both treatment and control groups did not significantly differ [11]. In our study, the effect of birth order on prevalence of malnutrition was not found. It can be due to low number (28%) of higher than 2 birth rank. But it should be noted that the birth order inversely correlated with height for age score. Malekzadeh study also did not find significant statistical association between birth order and malnutrition [7], but in some other studies, there was correlation between malnutrition and birth order, so, the more birth order, rate of malnutrition increase in child [14]. In the present study, the prevalence of stunting in children with cow's milk or formula until 6 months of age compared to those who consumed only breast milk was significantly higher. Kalantari study also revealed that children who were fed exclusively with breast milk in the first 6 months of life than who were fed exclusively with breast milk, 3.04 times more likely to suffer delayed growth [11].

In the present study, the mother's current age and age at birth of child malnutrition had no significant effect. Since the current age of all women was over age 18 and only one of labor was under 18 years of old and the risk of gestational age below 18 years can be dangerous [14], this lack of efficacy is explained. The study conducted in the rural city of Kerman showed no correlation between maternal ages at child birth, malnutrition [17]. While the Indian study showed that malnutrition in infants born from mothers 18-30 years less than women younger than 18 or older than 35 years [15]. In the present study, maternal body mass index had no significant effect on the prevalence of underweight children. However, due to the increase in body mass index and reach to BMI of 30 ( $\text{kg/m}^2$ ), stunting is low, and stunting among children increased over this border again, the obese mother-malnourished child hypothesis [14] will be further strengthened. Because of better relationship between maternal BMI and nutritional status of children and no effect of height and effect of weight only on underweight we can say that maternal body mass index, compared to his height and weight is better indicator of child's nutritional status. In our study, significant effect of

maternal nutritional knowledge was presented on the prevalence of stunting, wasting and underweight children. Based on the logistic regression model, mother knowledge was showed as one of the factors predictive of height for age and weight for height z-scores of their children. Kalantari study also found that according to the logistic model that if all other variables was constant, for every point increase in maternal nutrition knowledge, growth retardation is reduced the 10% [11]. Similar results were obtained in Rymaz study [16]. In our study, maternal employment status had non-significant effect on child malnutrition.

The non-significant effects of maternal employment on the nutritional status of children perhaps due to the small number of mothers are working mothers and non-occupational diversity. Soheili and Kalantari study also showed the same result in this field [1, 11] while the study carried out in Kerman showed statistically significant association between employment and malnutrition prevalence among children [18]. In our study, the children refer to health care centers showed effect on the prevalence of stunting and underweight and based on Logistic regression analysis regular visits to child care centers, was as one of the most important factors in reducing the chances of stunting and underweight. In Malekzadeh study, children refer to health care centers in rural areas had significant effect on weight-for-age and height-for-age z-score, but in urban areas did not show any correlation [8]. The Kalantari et al. and Rymaz study found no relationship in this area [11, 16]. In the present study, the prevalence of obesity in children who consume cow's milk formula or up to 6 months than those who get only breast milk was significantly higher. Lactation showed negative correlation with indexes of weight for height. Different mechanisms involved in breast milk to reduce obesity have been reported. Breast milk contains ingredients that can stimulate factors such as tumor necrosis factor alpha (TNF- $\alpha$ ) and epidermal growth factor (EGF), which is an inhibitor of cell division and differentiation of fat cells (adipocytes). Protein ratio to other nutrients in breast milk also may be effective in this regard. In addition, milk proteins such as immunoglobulins are resistant to the acidity and proteolysis and not be fully digested therefore. However, too much protein in milk can lead to secretion of insulin and insulin-like growth factor. It has also been observed that plasma insulin concentrations in breast milk than formula fed infants was greater; this can lead to increase of fat deposition and increase of formation and growth of adipocytes cells in the body. Long-chain fatty acids with a double bond are other breast compounds that may be to be effective in the prevention of obesity later in life, there are many of these fatty acids in the brain and prevents cytokine production increases the number of insulin receptors in various tissues, and improves insulin action and other neurotransmitters in the brain. Due to the complex interaction of a number of neurotransmitters and insulin and its receptors in the brain ultimately regulates the food intake the importance of these fatty acids in the first year of life is clear [19].

**Table 1.** Distribution of prevalence of malnutrition, nutritional stunting, wasting and underweight in children under 5 years of the Bandar Turkmen city on the mother's knowledge of nutrition

Mother's nutritional knowledge	Number	Stunting N (%)	Underweight N (%)	Wasting N (%)
Low	107	23 (21.5)	15 (14)	15 (14)
Moderate	499	19 (3.8)	8 (1.6)	8 (1.6)
Well	10	10 (1)	10 (1)	10 (1)
Total	616	43 (7)	24 (3.9)	23 (3.7)
p-Value		<0.001	<0.001	<0.001

**Table 2.** Major logistic model to identify the most important predictors of stunting in children under 5 years of Bandar Turkmen

Model index	Beta Coefficient	Exp (B)	p- Value
Mother's knowledge			
Moderate	1.74	5.74	0.001
Well	2.428	11.33	0.01
Regular visits to the child health center	0.889	2.43	0.021

Formulated milk have more energy than the breast milk and type of it's proteins that may stimulate the immune system of child, therefore a child who is deprived of breastfeeding immunoglobulins will be more injury to immunological response [20]. Cow milk in addition to having more energy compared to breast milk, it can reduce energy consumption during sleep in children, which is effective in obesity [21]. Because of physical and emotional benefits of breastfeeding to the first two years of life, for both mother and infant and preventive effect on overweight and obesity and therefore non-communicable diseases caused by obesity in adults, families need to be given more training in this regard. Encourage mothers to continue with breastfeeding, in addition to healthing during infancy and childhood, can be a step toward primary prevention of obesity and its related diseases later. Logistic regression results of our study showed that breast feeding up to 6 months could reduce obesity. Baker study also coordinated with the

results of our study [22] so that breastfeeding of infants to aged less than 4 months, and the more weight gaining [22]. According to the announcement of the mothers in our study, none of the infants under 4 months of age was not given food aid. This could suggest a good knowledge of maternal about health care and more their effort. In the present study, mother's now age greater than 37 years old and mother's age greater than 35 years during childbirth her baby are directly related to incidence of childhood obesity. In this study, there was no relationship between maternal height and childhood obesity. Mother's height, weight and BMI showed a direct correlation scores child's height for age. Bergmann et al. in a long-term Cohort study approved the effect of maternal BMI>27 (kg/m<sup>2</sup>) on overweight and obesity in children [23]. In a few studies, the effect of maternal current BMI obesity in children was considered. In most international studies, the role of maternal pre-pregnancy BMI in childhood obesity has been studied. Baker's study showed significant effects of maternal BMI before pregnancy on weight of child [22].

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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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