

## Growth of Head Circumference, Weight and Height from Birth to 18 Months in the South of Iran

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### Abstract

**Background:** Assessing the growth of infants is a main parameter in their health assessment. Thus, we have studied the growth condition of children from born to 18 months in this research in Bandar Abbas, Iran, 2015.

**Methods:** In this descriptive study, we have selected 125 case records from the dataset of health center number 8 of Bandar Abbas by means of simple randomized sampling. All data about the growth of children (height, weight and head circumference) and their parents' characteristics were gathered and analyzed by SPSS version 19.

**Results:** All of the growth curves (height, weight and head circumference) in children who born between March 20, 2012 and March 21, 2013 in Bandar Abbas were in normal range by the age of eighteen months. The height of breastfed individuals were considerably higher than formula fed children ( $P < 0.05$ ). In addition, children whose mothers were under 30 years of age, were taller than the others ( $P < 0.05$ ).

**Conclusions:** We can conclude that the growth patterns of children is desirable in Bandar Abbas and also it can improve by breastfeeding. In addition, the ages of mothers are another determinant in the growth of infants.

**Keywords:** Growth, Infants, Health center, Malnutrition

### Introduction

Malnutrition is a main health problem in developing countries particularly in some areas of Southern Asia and sub-Saharan Africa (1, 2). It can mainly affects the young children of the societies and is strongly associated with the risk of death in them (3). Indeed, this is the direct cause of 300,000 deaths per year in young children. Majority of the manifestations of undernutrition can be observed in the growth of children, including poor weight gain for height and slowing of brain growth (3-5). On the other hand, head circumference is an appropriate index of total brain volume (6). Therefore, growth and nutritional status of children in a specific community are mostly monitored by regular measurements of head circumference, weight and height (7). Considering the differences in nutritional quality of various populations, it is necessary to identify the growth curve of children in any area (8). In fact this type of nutritional monitoring can help the authorities to be aware about the health of children. In addition, the comparison of the curve in different populations or

in the same area at diverse times, enables us to assess the progress in the nutritional quality of children (9). The degree of malnutrition in a given country depends on the several factors including the economic situation, level of sanitation, cultural and religious beliefs, climate conditions, the level of education, food production, breast-feeding habits, the quality of nutrition programs and health services (1). Unfortunately, previous published data in Iran merely considered the weight and height of subjects and indicated that weight curve of children is significantly different with the standard values especially in the subjects aged 6 to 18 months (10). This deficiency was more evident in the south of Iran due to the higher prevalence of poverty and lower levels of health level in these areas (11). In addition to this fact, the lack of investigations in relation to growth in the head circumference of children prompted us to carry out this project. In this paper we present the data on head circumference, length and height of children from birth to 18 months in Bandar Abbas, Iran to demonstrate and compare the

growth curves with standards and also clarify the associated factors.

## Methods

This descriptive study was carried out in 2015 at the "Urban Health Center 8" in Bandar Abbas, Iran. The study population included all children born between March 20, 2012 and March 21, 2013 (a complete Iranian calendar year) that were covered by health center number 8 of Bandar Abbas. The number of case records in this dataset center in the mentioned period was assessed and then the sample size was calculated by statistical methods. Based on this calculation, one hundred and twenty-five case records were extracted by simple random sampling technique and used for data gathering. This strategy was performed by assigning a number to each case and a table of random numbers to identify which records were to be selected. All personal data were kept confidential and those data which we were not allowed to examine or participate in the project, were ruled out. The required data were entered by a trained medical student to a two part checklist with a following items: a section for demographic features including gender, type of parturitions, number of pregnancies, feeding, ages of mother and father, number of abortions, number of siblings and the number of parturitions. On the other hand, the other part of the checklist was designed for specialized data of this survey including head circumference, length and height of children. Measurements were conducted during the regular periodical health examinations by instructed health professionals and the same method was used to measure head circumference, weight and height of subjects to avoid the majority of personal errors. The values were available for the time of born and first, second, fourth, sixth, seventh, ninth, twelfth, fifteenth and eighteenth months for each child. Records with invalid or incomplete data and Children with diagnosed growth problems and those on medication known to interfere with growth were excluded from the investigation. In addition children with abnormal birth weight (<2500 g) were removed. All statistical analyses were conducted using SPSS version 19 for Windows. The obtained data were

statistically analyzed using T-test for quantitative data and K-square for qualitative data. For all comparisons, a two sided  $\alpha = 0.05$  was considered statistically significant.

## Results

Twenty one case records were removed during the research period due to the incomplete data and thus a total of 104 records were investigated in this study. Forty-eight (46.2%) of the children were female and 56 (53.8%) were male. The mean age of fathers was  $33.57 \pm 5.16$ , ranging from 21 to 49 years. On the other hand, the mean age of mothers was  $29.76 \pm 4.86$ , ranging from 20 to 47 years. Among this population of children, 86 of whom (82.7%) were breastfed, 10 (9.6%) were formula fed and the others (7.7%) consumed both of them, simultaneously. Of 104 women who had given birth, 53 (51%) had undergone caesarean section (CS) while others (49%) had undergone normal vaginal delivery (NVD). The values of mean and standard deviation of height, weight and head circumference of subjects are indicated in table 1. Figures 1 and 2 also demonstrate the comparison of the growth curves for height, weight and head circumference with standard values in subjects. According to the graphs, there are no significant differences between the drawn graphs and standard curves. On the other hand, data analysis revealed that the height of breastfed individuals were considerably higher than formula fed children ( $P < 0.05$ ). In addition, children whose mothers were under 30 years of age, were taller than the others ( $P < 0.05$ ). However, none of the other variables indicated the association with growth of infants.

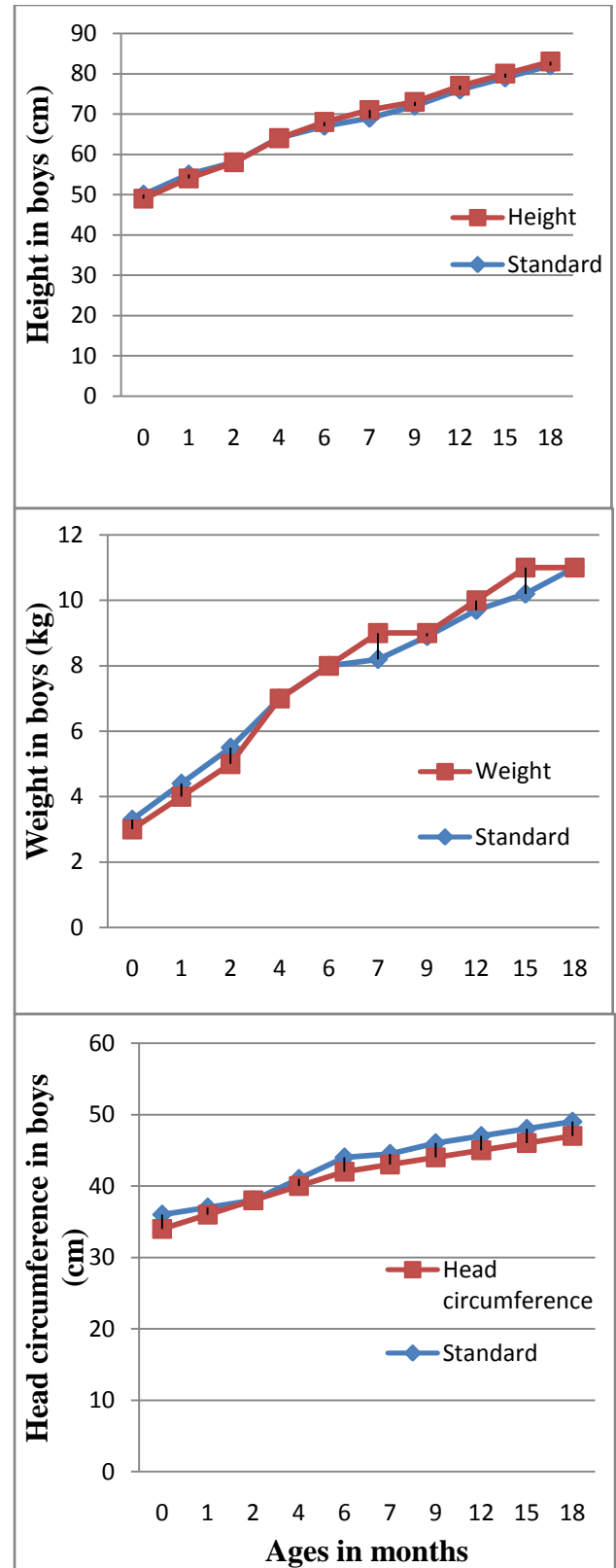
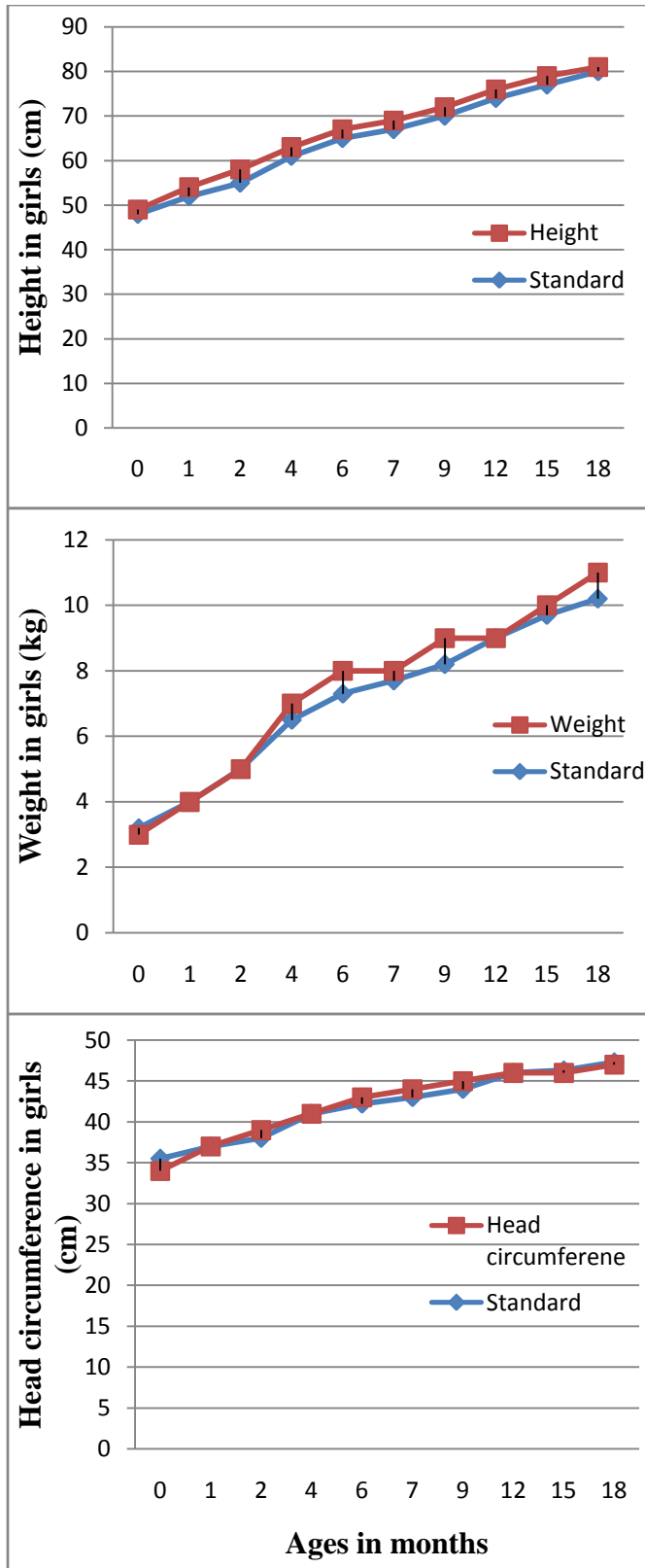


Figure 1. Comparison of the growth curves for height, weight and head circumference with standard values in girls.

Figure 2. Comparison of the growth curves for height, weight and head circumference with standard values in boys.

**Table 1.** Mean and standard deviation of height, weight and head circumference

Age	Boys			Girls		
	Height (cm)	Weight (Kg)	Head circumference (cm)	Height (cm)	Weight (Kg)	Head circumference (cm)
Birth	49±3	3±1	34±2	49±2	3±1	34±2
1 month	54±2	4±1	37±1	54±2	4±1	36±1
2 months	58±2	5±1	39±1	58±2	5±1	38±1
4 months	64±2	7±1	41±1	63±2	7±1	40±1
6 months	68±2	8±1	43±1	67±2	8±1	42±1
7 months	71±2	9±1	44±1	69±3	8±1	43±1
9 months	73±10	9±1	45±1	72±2	9±1	44±1
12 months	77±3	10±5	46±2	76±3	9±1	45±1
15 months	80±3	11±1	46±5	79±3	10±1	46±1
18 months	83±3	11±2	47±1	81±2	11±1	47±1

## Discussion

In the present observation, we could illustrate that the development process and growth curves in children who born between March 20, 2012 and March 21, 2013 in Bandar Abbas were in normal range by the age of eighteen months. In this regard, two similar investigations were conducted in Bandar Abbas in several past years (10, 11). Hoseinzade et al in 2004 examined the growth of children from birth to 24 months and found that the weight growth curve in the study population was significantly lower than standard values, while the height curve was normal. They reported that the difference was more intuitive between the ages of 6 and 18 months and it was strongly associated with the education levels of parents and employment status of fathers (10). On the other hand, the similar findings were reported by another study in Bandar Abbas in 2005 (11). This contrast between the results of our survey with the literature may be due to the notable progresses in the health condition and the services of health

centers during the last decade. In addition, nutritional status of children and the breastfeeding mothers improved significantly in this period (12, 13).

Further analysis in present article showed that breast feeding can lead to better improvement and growth of infants. This is in agree with lots of reliable studies and experiments in this issue (14, 15). In fact, at the same weight, infants who are breastfed are thinner and longer as compared with formula fed subjects. In accordance to a recent cross sectional study, this result suggests that the prevalence of obesity in breastfed children is higher. Rudiger von Kries and et al reported that the prevalence of obesity in children who had never been breast fed was 4.5% as compared with 2.8% in breastfed children (16). Another study in this issue investigated the growth of breastfed and formula fed infants from 0 to 18 months in two cohorts which were matched for education, parental socioeconomic status, anthropometric characteristics, ethnic group, infant gender and birth weight. The authors found a

better growth in weight of formula fed infants while the length and head circumference values were similar between groups (17). The variety can be due to the differences in nutritional quality of breastfeeding mothers and also their age. In support of this argument we should refer to the other findings of present article. As mentioned, we found that younger mothers can lead to better growth in children. The higher power of breastfeeding and the better quality of breast milk in younger females are the main causes of this event (18, 19). Finally we can conclude that infant's growth is desirable in Bandar Abbas and also it can improve by breastfeeding especially with younger mothers. However, the findings of this observation should be reported with caution, as it was limited in various ways including not matched features of parents, such as their educational level or economic situation. Therefore, further investigations are suggested to consider these variables.

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### Conflict of Interest

The authors declare that they have no conflict of interests.

### References

1. Müller O, Krawinkel M. Malnutrition and health in developing countries. *Canadian Medical Association Journal*. 2005;173(3):279-86.
2. Schofield C, Ashworth A. Why have mortality rates for severe malnutrition remained so high? *Bulletin of the World Health Organization*. 1996;74(2):223.
3. Black RE, Morris SS, Bryce J. Where and why are 10 million children dying every year? *The Lancet*. 2003;361(9376):2226-34.
4. Fernandez ID, Himes JH, Onis Md. Prevalence of nutritional wasting in populations: building

- explanatory models using secondary data. *Bulletin of the World Health Organization*. 2002;80(4):282-91.
5. Müller O, Garenne M, Kouyaté B, Becher H. The association between protein-energy malnutrition, malaria morbidity and all-cause mortality in West African children. *Tropical Medicine & International Health*. 2003;8(6):507-11.
6. Bartholomeusz H, Courchesne E, Karns C. Relationship between head circumference and brain volume in healthy normal toddlers, children, and adults. *Neuropediatrics*. 2002;33(5):239-41.
7. Wikland KA, Luo Z, Niklasson A, Karlberg J. Swedish population-based longitudinal reference values from birth to 18 years of age for height, weight and head circumference. *Acta paediatrica*. 2002;91(7):739-54.
8. Kramer MS, Platt RW, Wen SW, Joseph K, Allen A, Abrahamowicz M, et al. A new and improved population-based Canadian reference for birth weight for gestational age. *Pediatrics*. 2001;108(2):e35-e.
9. Eberhardt L, Breiwick J, Demaster D. Analyzing population growth curves. *Oikos*. 2008;117(8):1240-6.
10. Hosseinzade K, Pormehr A, Rahmati R, Yosefi H. Comparing the growth of under 2 years old children referring to health centers of Bandar Abbas with NCHS standard curve. 2005; 15(1): 39-44.
11. Hosseinzade K, Yosefi H, Pormehr A, Sobhani GH, Rahmati R, Asadi F. Growth from birth to 24 months of age in children under the guise of health centers in Bandar Abbas-2004. 2005; 9(1): 29-33.
12. Olang B, Heidarzadeh A, Strandvik B, Yngve A. Reasons given by mothers for discontinuing breastfeeding in Iran. *Int Breastfeed J*. 2012;7(7).
13. Olang B, Farivar K, Heidarzadeh A, Strandvik B, Yngve A. Breastfeeding in Iran: prevalence, duration and current recommendations. *Int Breastfeed J*. 2009;4(8).
14. Heinig MJ. Host defense benefits of breastfeeding for the infant: effect of breastfeeding duration and exclusivity. *Pediatric Clinics of North America*. 2001;48(1):105-23.
15. Sikorski J, Renfrew MJ, Pindoria S, Wade A. Support for breastfeeding mothers: a systematic review. *Paediatric and perinatal epidemiology*. 2003;17(4):407-17.
16. Von Kries R, Koletzko B, Sauerwald T, Von Mutius E, Barnert D, Grunert V, et al. Breast feeding and obesity: cross sectional study. *Bmj*. 1999;319(7203):147-50.
17. Dewey KG, Heinig MJ, Nommsen LA, Pearson JM, Lönnerdal B. Growth of breast-fed and formula-fed infants from 0 to 18 months: the DARLING Study. *Pediatrics*. 1992;89(6):1035-41.
18. Arora S, McLunkin C, Wehrer J, Kuhn P. Major factors influencing breastfeeding rates: Mother's perception of father's attitude and milk supply. *Pediatrics*. 2000;106(5):e67-e.
19. Britton C, McCormick F, Renfrew M, Wade A, King S. Support for breastfeeding mothers (Review). *Cochrane Database Syst Rev*. 2007;1:CD001141.