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A Comparison between Anthropometric Characteristics of Children Ages Three to Six Years Old of Kindergartens of District 3 of Ahwaz Education with NCHS Standard-1391

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ABSTRACT

One of the important anthropometric indicators of children is height and weight, and defects in them represent a hiatus in the optimal growth of children. The present study aimed to compare the height and weight of children in the age group of three to six years in the kindergartens of education district three of Ahwaz (Khuzestan, Iran) with the NCHS standard. In this descriptive cross-sectional study, weight and height of 495 children in the age group of three to six years, in the kindergarten of the education district three of Ahwaz with an accuracy of 0.13 kg and 0.1 cm were measured. Statistical data were analyzed in SPSS statistical package using binomial test. The height of boys in percentiles of 10 up to 75 in six years old and their weight in four to six years has significantly been lower than NCHS ($P < 0.05$). The height of girls in five years old and their weight in *five*-and-half to six years were significantly lower than the NCHS ($P < 0.05$). Height of boys and girls in the three to six years age group were similar to the standard and in some percentiles were observed higher than it. Low weight of boys and girls respectively in the four to six and six years age groups, compared to the NCHS indicates high chance of acute malnutrition in the boys and girls of these age groups. In the age group of *five*-and-*half* to six years, nutritional problems are high while in children under the age of *five*-and-*half* years nutritional status according to the height and weight are in accordance with the standard.

Key words: Height; Weight; Kindergarten**.**

INTRODUCTION

The outward signs of growth are the height and weight of children. However, the child's height and weight is a good indicator for determining nutritional status. A comparison between the height and weight of children with standard tables can be used for screening by finding malnutrition cases[2]. The most common approach to monitoring growth in children is a measurement of anthropometric indices[3]. Indices related to nutritional status of children is one of the most sensitive indicators associated with a sudden change in health status and access to food; so, the health status of children can be evaluated in association with acute and immediate factors (such as food insufficiency currently, children diseases, especially diarrhea), which leads to Low weight of child, and in association with prolonged deprivation of food, and chronic infectious disease that results in short stature[4,5]. Measurement of variables such as age, weight, height compared with standard growth charts are usually used to calculate the anthropometric indices. Deviation in growth patterns indicates the non-specific symptoms but very important in diagnosing severe diseases. This deviation is often the first sign of a problem in child that sometimes parents do not realize. Successive measurements are much valued more than a single measurement because it can recognize tilt in a certain pattern of growth, even if the resulting values in the normal range[3]. Reviews carried out in Iran in 1991 and 1995 showed that malnutrition in children under five years old is of high prevalence. So, they are important due to the importance of monitoring the growth of and improving child nutrition in order to maintain, meet and improve their health, and given that the growth curves is the easiest and most useful way which is used in this program also its results are used in the provincial and municipal planning, including executive and training plans. Therefore, we compared the height and weight of children three to six-and-half years of age in the state kindergartens of district 3 of Ahvaz, situated in southwest of Iran with the NCHS standard. NCHS charts were prepared for normal children and in areas where standards are not acceptable, they are recommended to understand how children grow[6, 7]. It is evident that the findings of this study while giving the status *quo* description and provide information at the above time, can be effective in developing a model for evaluation of growth status as well as the implementation of an intervention in the society.

MATERIALS AND METHODS

In this cross-sectional study, 495 children (230 girls and 265 boys) aged three to six-and- half years old in the state kindergartens of the district three in Ahvaz during two months in 2008 were studied according to measurement of weight in kilograms and height in centimeters. With at least clothing baby stands on the adult scale. Prior to weighing, to ensure accuracy of the scale of control weight (2 kg), to be adjusted scale and read the exact weigh are needed and when weighing a child should be quiet. Height of children older than two years old is measured in a standing state; child stands beside the wall; a part of meter, which has 90 degrees angle to the wall, places on the child's head and while behind the heels completely and legs and head are tangent to the wall and the baby's head is to the sides of the opposite side, the height is read. Because the growth of a phenomenon is age-related, to avoid false diagnosis it is necessary to know the exact age of the child; therefore, each method can be used to find the exact age on the growth card. We have no problem with a child, who has a growth curve and has been marked from birth, but sometimes we see a child who spent more time on his or her age and has referred because of a disease and we want to calculate his or her age. An example is given below:

If a child has been born on February 12, 1996, and is now June 12, 1999, age of this child is two years and five months.

12/04/99
12/11/96
00/05/2

It means that we subtract one year from 99 and add 12 months to 4 that it gets 16 in order to subtract 11 from it. Data on age, sex, height and weight were collected using questionnaires. Weight was measured using Seca scales with a precision of 100 g and with minimal clothing and no shoes. height in children was measured by a meter in Seca precision 0.1 cm standing without shoes and 4 points of the body (heel, hip, shoulder and back) attached to the wall. The exact age of the children was extracted using the file students in kindergarten.

RESULTS

According to the studies, no significant difference existed between percentile of the height of the boys aged three as well as three-and-half years of age with the standard; however, among the boys aged three in the 10th percentile as well as among boys aged three-and-half years old in the 75th percentile the weight was lower than the standard (Table 1). The heights of four-year-old boys in percentiles of 90, 95 and 97 were higher than the standard and their weights at percentiles of 3, 5, 10 and 25 were lower than the standard. The height in the boys aged four-and-half years old in the 25th percentile was higher than the standard and their weight in all percentiles was not significantly different with the standard. In the boys aged five-and-half years old in the percentiles of 3, 5, 10 and 25 were lower than the standard.The

Table 1: Comparison of the height of boys in the age group of 3 to 6.5 years old against NCHS.

Centile	3th			5th			10th			25th			50th			75th			90th			95th			97th		
	Ahvaz	NCHS	**Pv**	Ahvaz	NCHS	**Pv**	Ahvaz	NCHS	**Pv**	Ahvaz	NCHS	**Pv**	Ahvaz	NCHS	**Pv**	Ahvaz	NCHS	**Pv**	Ahvaz	NCHS	**Pv**	Ahvaz	NCHS	**Pv**	Ahvaz	NCHS	**Pv**
3	90.70	88.37	0.88	90.70	89.20	0.81	90.70	90.49	0.65	90.82	92.71	0.26	94.25	9527	1	9752	97.92	0.31	97.60	100.40	0.65	97.60	101.93	0.81	97.60	102.94	0.88
3.5	95.20	91.59	0.78	95.20	92.49	0.66	95.20	93.91	0.0.43	98.77	96.30	0.36	100.50	99.00	0.28	101.87	101.75	0.11	103.20	104.27	0.43	103.20	105.80	0.66	103.20	106.80	0.78
4	96.5	94.59	0.51	96.74	95.58	0.32	98.13	97.10	0.33	99.5	99.65	0.48	102.60	102.51	0.83	107.40	105.37	0.16	111.61	107.96	0.01	113.27	109.52	0.09	113.50	110.53	0.02
4.5	96.20	97.48	0.57	97.45	98.53	0.58	101.65	100.16	0.21	103.75	102.87	0.05	106.30	105.88	0.18	110.15	108.87	0.24	112.21	111.55	0.14	112.57	113.15	0.23	112.80	114.19	0.42
5	96.70	100.33	0.57	100.57	101.45	0.58	105.66	103.17	0.21	107.60	106.02	0.05	110.20	109.17	0.57	112.95	112.29	0.06	115.89	115.09	0.54	117.63	116.75	0.41	118.40	117.83	0.57
5.5	101.96	103.20	0.30	103.05	104.36	0.39	106.75	106.16	0.22	108.22	109.14	0.23	112.65	112.42	0.70	116.67	115.69	0.09	119.80	118.60	0.05	121.37	120.34	0.21	123.00	121.46	0.30
6	106.83	106.10	0.27	109.23	107.30	0.38	109.92	109.16	0.02	113.80	112.24	0.07	116.90	115.66	0.01	119.00	119.06	0.43	121.32	122.11	0.13	122.97	123.92	0.57	125.04	125.10	0.52
6.5	104.00	109.03	0.18	104.70	110.26	0.13	108.80	112.16	0.002	111.47	115.33	0.01	116.10	118.86	0.009	118.07	122.40	0.02	121.87	125.58	0.25	124.45	127.49	0.26	125.50	128.73	0.45

Table 2: Comparison of the height of girls in the age group of 3 to 6.5 years old against NCHS

Centile	3th			5th			10th			25th			50th			75th			90th			95th			97th		
age group	Ahvaz	NCHS	**Pv**	Ahvaz	NCHS	**Pv**	Ahvaz	NCHS	**Pv**	Ahvaz	NCHS	**Pv**	Ahvaz	NCHS	**Pv**	Ahvaz	NCHS	**Pv**	Ahvaz	NCHS	**Pv**	Ahvaz	NCHS	**Pv**	Ahvaz	NCHS	**Pv**
3	88.60	86.90	0.80	88.60	87.80	0.69	88.60	89.20	0.52	91.50	91.56	0.55	94.20	94.21	1	99.70	96.90	0.24	100.20	99.34	0.14	100.20	100.82	0.30	100.20	101.79	0.80
3.5	89.40	90.01	0.30	89.40	90.95	0.11	89.82	92.40	0.34	93.57	94.86	0.35	97.20	97.64	1	100.55	100.48	0.60	102.84	103.07	0.28	102.90	104.64	0.54	102.90	105.67	0.69
4	93.70	93.06	0.76	93.70	94.04	0.36	93.70	95.55	0.61	98.30	98.11	0.60	103.70	101.03	1	106.50	104.01	0.16	109.60	106.75	0.22	109.60	108.42	0.36	109.60	109.51	0.23
4.5	96.80	96.17	0.56	96.80	97.18	0.62	97.80	98.74	0.57	104.20	101.41	0.26	105.60	104.46	0.01	110.20	107.59	0.33	113.70	110.48	0.03	117.10	112.24	0.06	117.10	113.40	0.10
5	99.85	99.35	0.28	100.18	100.38	0.66	103.86	102.01	0.40	108.20	104.78	0.01	111.30	107.95	2.53	113.10	111.23	0.00	116.5	114.27	0.11	120.60	116.13	0.05	130.99	117.35	0.34
5.5	104.47	102.56	0.15	105.03	103.63	0.04	107.02	105.31	0.12	109.20	108.18	0.03	112.20	111.48	0.07	115.55	114.90	0.01	118.38	118.08	0.58	118.89	120.03	0.18	120.23	121.32	0.45
6	107.40	105.76	0.13	107.70	106.87	0.03	109.21	108.60	0.19	111.80	111.58	0.12	115.55	115.00	0.53	119.32	118.55	0.27	122.99	121.87	0.11	124.66	123.90	0.11	124.89	125.25	0.13
6.5	104.00	108.88	0.36	104.00	110.02	0.03	106.94	111.82	0.05	110.70	114.90	0.53	116.00	118.44	0.007	117.40	122.13	0.01	119.62	125.56	0.20	121.00	127.68	0.46	121.00	129.07	0.63

3th			5th			10th			25th			50th			75th			90th			95th			97th		
Ahvaz	NCHS	**Pv**	Ahvaz	NCHS	**Pv**	Ahvaz	NCHS	**Pv**	Ahvaz	NCHS	**Pv**	Ahvaz	NCHS	**Pv**	Ahvaz	NCHS	**Pv**	Ahvaz	NCHS	**Pv**	Ahvaz	NCHS	**Pv**	Ahvaz	NCHS	**Pv**
12.00	11.81	0.88	12.00	12.09	0.18	12.00	12.55	0.05	12.12	13.37	0.26	13.5	14.40	1	14.72	15.55	0.31	14.80	16.73	0.65	14.80	17.51	0.81	14.80	18.04	0.88
12.80	12.54	0.78	12.80	12.83	0.33	12.80	13.32	0.56	15.20	14.20	0.36	15.35	15.31	1	15.50	16.60	0.10	16.20	17.93	0.43	16.20	18.82	0.66	16.20	19.45	0.78
11.50	13.29	0.003	11.65	13.61	0.02	12.65	14.13	0.06	14.37	15.09	0.07	15.35	16.31	0.28	17.20	17.74	0.51	18.50	19.25	0.33	28.70	20.28	0.69	30.50	21.00	0.48
13.00	14.06	0.20	13.45	14.41	0.41	14.72	14.97	0.30	15.20	16.02	0.13	17.00	17.37	0.18	18.55	18.97	0.26	19.80	20.68	0.05	20.18	21.85	0.23	20.5	22.68	0.42
14.00	14.85	0.20	14.09	15.23	0.41	15.82	15.84	0.45	16.80	16.99	0.40	17.65	18.48	0.85	19.15	20.26	0.13	21.55	22.17	0.21	22.55	23.50	0.23	23.00	24.46	0.42
15.40	15.66	0.04	15.50	16.07	0.04	15.90	16.74	0.02	17.05	17.98	0.09	18.50	19.62	0.10	21.37	21.58	0.45	23.90	23.73	0.18	26.42	25.23	0.39	31.96	26.32	0.30
15.79	16.50	0.001	16.20	16.93	0.02	16.50	17.65	0.009	18.65	19.00	0.20	20.8	20.77	0.82	22.50	22.93	0.33	25.00	25.33	0.24	29.10	27.03	0.57	33.44	28.27	0.25
14.00	17.36	8.69	14.05	17.82	0.00	15.11	18.58	0.01	17.20	20.03	0.04	20.35	21.95	0.009	22.05	24.32	0.02	25.49	26.99	0.51	28.95	28.91	0.62	29.20	30.33	0.45

97th	Pv	0.80	0.69	0.76	0.10	0.65	0.54	0.31	0.63
	NCHS	17.99	19.58	21.28	23.07	24.94	26.88	28.92	31.07
	Ahvaz	17.50	17.80	19.00	25.00	26.55	27.57	31.19	27.80
95th	Pv	0.30	0.54	0.63	0.06	0.38	0.40	0.23	0.46
	NCHS	17.36	18.83	20.39	22.03	23.75	25.53	27.39	29.36
	Ahvaz	17.50	17.80	19.00	25	22.95	24.00	29.43	27.80
90th	Pv	0.52	0.65	0.38	0.008	0.40	0.25	0.34	0.45
	NCHS	16.46	17.77	19.16	20.62	22.14	23.72	25.37	27.11
	Ahvaz	17.50	17.26	19.00	24.50	22.00	23.40	24.36	27.62
75th	Pv	0.44	0.15	0.60	0.17	0.54	0.03	0.03	0.23
	NCHS	15.16	16.27	17.44	18.67	19.95	21.27	22.66	24.12
	Ahvaz	15.00	15.50	17.70	21.20	20.00	20.20	21.85	23.20
50th	Pv	0.45	0.38	0.50	1	0.75	0.20	0.03	1
	NCHS	13.94	14.88	15.87	16.92	18.02	19.15	20.33	21.56
	Ahvaz	12.80	14.65	16.20	16.80	18.00	18.20	19.35	20.80
25th	Pv	0.07	0.64	0.60	0.33	0.31	0.06	0.00	0.31
	NCHS	12.90	13.72	14.59	15.51	16.47	17.47	18.49	19.56
	Ahvaz	11.80	13.62	14.10	15.00	16.00	16.65	17.15	18.20
10th	Pv	0.14	0.34	0.22	0.29	0.22	0.01	0.00	0.18
	NCHS	12.09	12.82	13.61	14.44	15.31	16.21	17.14	18.08
	Ahvaz	11.50	11.38	12.80	13.00	15.04	15.80	16.14	15.52
5th	Pv	0.30	0.11	0.07	0.06	0.38	0.18	0.001	0.03
	NCHS	11.65	12.34	13.09	13.88	14.70	15.56	16.43	17.32
	Ahvaz	11.50	11.20	12.80	12.80	14.82	14.87	15.60	14.50
3th	Pv	0.80	0.04	0.76	0.10	0.65	0.27	0.01	0.07
	NCHS	11.38	12.05	12.77	13.53	14.34	15.17	16.01	16.86
	Ahvaz	11.50	11.20	12.80	12.80	14.20	14.75	15.5	14.50

height in the boys aged six years old in the percentiles of 10, 25 and 50 was higher than the standard and their weight at percentiles of 3, 5, 10 and 25 was lower than the standard. The height in the boys aged six-and-half years old in the percentiles of 10, 25, 50, and 75 and their weight at percentiles of 5, 10, 25, 50 and 75, both were lower than the standard. The height of girls aged three years old in all percentiles was not significantly different to the standard but their weight in the 25 percentile was less than the standard. Height in girls aged four year-old in all percentiles was not significantly different with the standard but weight in the 5th percentile was less than the standard (Table 1).

Height of the girls aged four-and-half years old in the percentiles of 50, 90 and 95 was higher than the standard criteria and their weight at 5th percentile was lower than the standard (Table 2). The height of girls aged five in the percentiles of 25, 75, and 95 was higher than the standard but their weight at the percentiles was not significantly different with the standard. The height of girls aged five-and-half years old in the percentiles of 5, 25, and 75 was higher than the standard and their weight at the percentiles of 10, 25 and 75 was lower than the standard. The height of girls aged six in the percentiles of 3, 5, 10, 25, 50, and 75 was lower than the standard. The height of girls aged six-and-half years in the percentiles of 5, 10, 50 and 75 was lower than the standard (Table 2).

DISCUSSION

In a study conducted on 491 children in Gorgan County, height and weight of the children studied was lower than NCHS standard[11]. Additionally, in a study conducted on children 2-5 years old in the villages of the County of Khorramabad during the summer of 1994, the results showed that all children were with underweight, growth retardation and Weight Loss[12]. During investigations on the height and weight of children of all ages in the Tonekabon County, results showed that the height and weight of the children were below the NCHS standard[13]. A cross-sectional study of 8543 healthy boys and girls aged 2-6 years old in Kashan County showed that weight growth of the girls up to one year in the percentiles of 3 and 5 during different months was higher than the boys. But in the 50 percentile and above weights of boys was higher than girls' ones. Moreover, compared with NCHS standards based on weight-for-age, respectively, were 29.7 and 21.9% for boys and girls having 61 to 72 months old were below the 3th percentile, and 5.1 and 5.8% of boys and girls were above the 97th percentile. In the percentiles higher than 3, height growth in boys was higher than in girls[15].

CONCLUSIONS

NCHS data is representative of a population of healthy and well-nourished children in the United States. However, the population is different with many countries in the world, NCHS curves by the World Health Organization (WHO) as an international standard for the growth during the first five years of life has been adopted for the entire countries. The difference in growth between developed and developing countries can be associated with the environmental conditions more than genetic differences. The experiences of countries have shown that all children under five years in optimum conditions potentially have the same growth potential. Our studies have also shown that Iranian children and adolescents in the upper strata of the economic and the health environment have optimal physical growth and comparable to the NCHS standard. According to the results in comparison with a standard, environmental factors can be effective in height and weight growth delay and therefore primary health care training to parents in order to correct nutrition leads to children's health in this stage of growth. Furthermore, to detect the height and weight differences between boys and girls and likely micro*nutrients* effective in short stature in children seem to be necessary. Due to the difference between the average height and weight percentiles for boys and girls in both age groups in other countries, it seems that a universal standard cannot be applied in all races and in all ages; so, it is suggested that a model is developed and is presented to determine the height and weight of children in Iran.

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