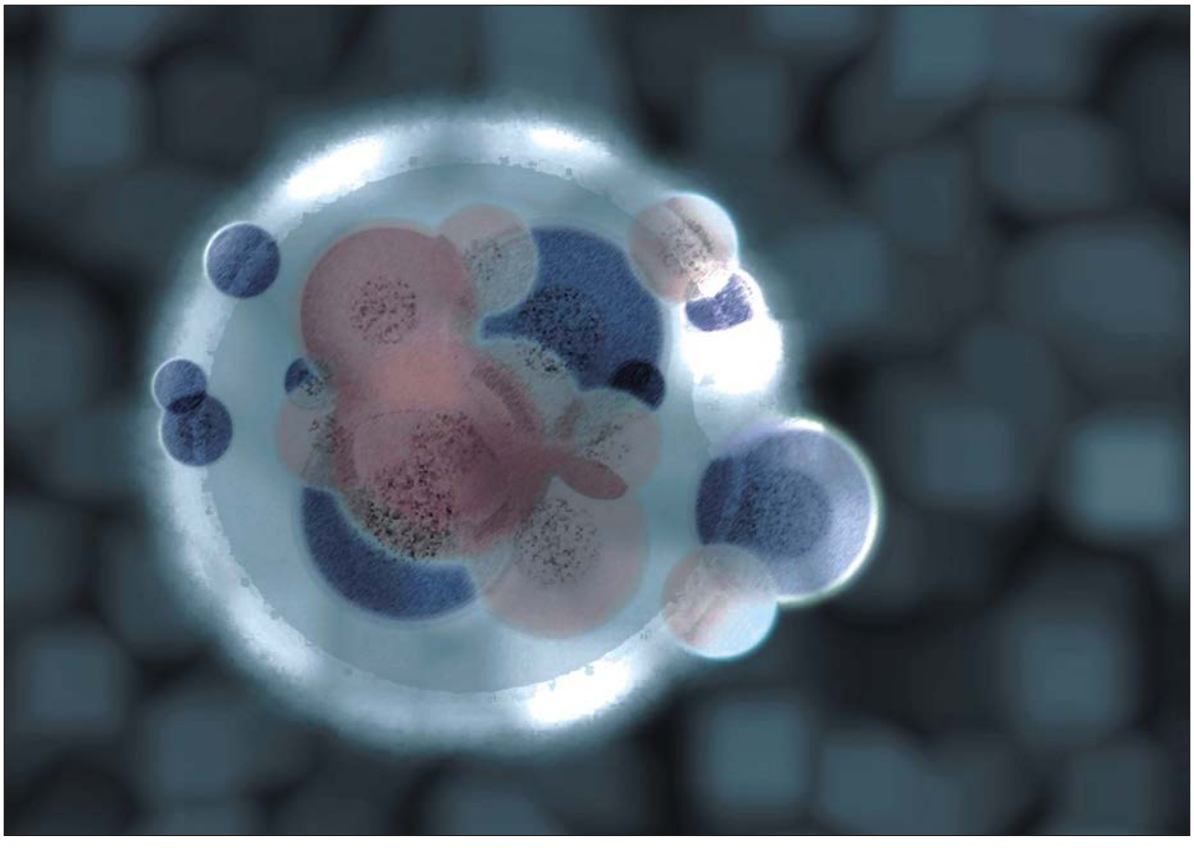

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Changes in Malnutrition Among Under 5 Years Old Children in North of Iran

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Abstract: This study was carried out to compare nutritional status among under 5 years old children in the villages of Gorgan districts (North of Iran) during 1997 (stage 1) and 2004 (stage 2). By using cluster and simple sampling, 20 villages were chosen and 20 persons completed the questionnaires and measured cases' weight and height. The sample size was 5497 (stage 1 = 2639 cases and stage 2 = 2858 cases). Data of two stages was merged to the file and was analyzed by spss.win software. NCHS standard was used for comparison. Three anthropometrics indexes used in this study were defined with following scale: Underweight, Stunting and Wasting. The data of two stages was merged in a file and analyzed by sps.win software NCHS standard was used to compare of data and under -2SD from median of it computed as a start paint of malnutrition. The prevalence of malnutrition based on underweight, stunting and wasting were 5.7%, 30.2 and 3.82% in 1997 (stage 1) and 4.3, 14.3 and 2.9% in 2004 (stage 2), respectively. Statistical difference was significant between two stages based on underweight ($p = 0.01$) and stunting ($p = 0.001$). Secular growth improvement in boys was better than in girls. Overall, nutritional status was improved during 1997 to 2004 and in comparison with weight, height improvement was better. More researches are necessary to determine what factors contribute to this situation.

Key words: Height, weight, malnutrition, children, village, Gorgan

INTRODUCTION

World children suffer from Protein Energy Malnutrition (Robbins *et al*., 2007) and UNICEF (WHO, 1995) reported that one-third of children were stunting in development countries in 2000.

Growth monitoring is one of the important ways to detect malnutrition and growth disorders in children (De Onis *et al*., 2000). Antheropometery is universally applicable, inexpensive and non-invasive methods are available to assess of the proportion the size and the composition of the human body. It shows health and nutritional status. Short stature and underweight cause lock of physical ability.

Several micronutrients, such as zinc, iron, iodine, selenium, vitamin A, B12 and B9 take part as the ingredient of some enzyme, hormone and their activities. Lack of above nutrients can affect on the bodies metabolism and physical growth trend (Pinhas-Hamiel *et al*., 2006, 2003). Sayari's (2000) study showed high prevalence of malnutrition among Iranian children in 1996 and 1998. He reported that Golestan province children (area of this study) were in the 1st level based on weight and in the 13th level by height among 28 provinces. There isn't any concord between trend of height and weight growth. Another study (Veghari *et al*., 2003) showed that children in this region suffer from stunting more than wasting. On base of these studies, growth failure is recognized as one of the most health problems in north of Iran and health managers applied some interventional planning for solving this problem. We carried out this study among under 5 years old children in a rural area of Gorgan (North of Iran) to determine changes in malnutrition after a 7 years period (1997 to 2004) by measuring weight, height and anthropometrics criteria and then we compared results of two stages data. Gorgan, is the capital city of Golestan Province in the north of Iran and according to the report of Iranian Statistical Center (ISC, 2006) has a population of more than 400,000 and on the basis of above report the villages population in this town is 46.1% as whole, which are mainly engaged in agricultural occupation. The number of under 5 years old children was 17370 and 16747 in 1997 and 2004, respectively.

MATERIALS AND METHODS

This is a cross-sectional study that carried out in villages of Gorgan (North of Iran) in two stages (1997 and 2004). Villages were chosen by using cluster and simple

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sampling. We have chosen 20 of 118 villages in 2 stages. All of under 5 children in this area were chosen as a sample. A health system worker from any village was instructed for collection of data. Questionnaires in tow stage were similar. Sample size were 2639 (male = 1309, Female = 1330) in first stage and 2858 (male = 1481, female = 1377) in second stage. Height, weight and birth date were recorded. The height of the children, who are not able to stand, were measured in a lying posture and the height of those who are able to stand were measured in a standing posture without shoes and 4 parts of their body (heel, scapula, back of the head) were attached to the wall. The weight, with less clothes, has been measured with scales confirmed by WHO and was recorded to the nearest 0.5 kg and height has been measured and it was recorded to the nearest 0.5 cm. The children's exact age has been selected from health records in health house. The National Center for Health Statistical (NCHS) standard (Ogdan *et al*., 2006; WHO, 1983) was used for comparison of groups. In addition, total of data was merged and analyzed by spss.win software. χ^2-test and t-test were used to compare two groups. Under 2 standard deviation (-2sd) from median of NCHS computed as a start paint of malnutrition (Vonk *et al*., 1993; Sidibe *et al*., 2007). Three anthropometrics Indexes in this study defined following scale: Underweight: weight-for-age. Stunting: Height-for-age. Wasting: weight-for-Height.

RESULTS

Mean of boy's weight between two stages was not statistically significant, but mean of height was significant between two stages after 12th months ($p<0.01$). Mean of height in all of age groups in 2004 was higher than 1997 (Table 1).

Mean of girls weight in 12-24 and 25-36 months age groups is significant between two stages ($p<0.02$) and mean of height is significant between two stages after 12th months ($p<0.01$) (Table 2).

Underweight declined 2.1 and 1.4% by -1sd and -2sd criteria, respectively in 2004 compare to 1997. 2 test is significant between two stages based on -2sd criteria ($p<0.01$). Differentiation on base of -3sd in 2004 is higher than 1997 but, it is not significant. The prevalence of underweight showed 4.3% in 2004 (Table 3).

Stunting declined 14.3, 15.9 and 10.3% on base of -1sd, -2sd and -3sd, respectively in 2004 compare to 1997. χ^2 test is significant between two stages ($p<0.001$). The prevalence of stunting showed 14.3% in 2004 (Table 4).

Wasting declined 2.2, 0.85 and 0.12% based on -1sd, -2sd and -3sd, respectively in 2004 compare to 1997. χ^2 test is significant between two stages on base of -1sd ($p<0.04$). The prevalence of wasting showed 2.97% in 2004 (Table 5).

Table 1: The comparison of (Mean±SD) Boys children weight and height in villages of Gorgan between 1997 and 2004

	1997 (1309 person)			2004 (1481 person)				
Age (months)	No.	Weight (kg)	Height (cm)	No.	Weight (kg)	Height (cm)	t-test (PV) weight	t-test (PV) height
0-12	272	7.73±2.3	65.18±8.5	361	7.60±2.2	66.01±9.1	0.487	0.243
12-24	249	11.12±1.7	78.15±6.9	314	11.12±1.4	80.50±5.4	0.963	0.001
24-36	254	13.25±1.9	87.05±6.8	286	13.37±1.6	90.02±5.6	0.688	0.004
36-48	254	14.86±1.8	93.85±7.4	292	14.92±1.6	96.93±5.8	0.245	0.010
48-60	280	16.27±1.9	100.67±7.6	228	16.36±1.8	103.47±5.6	0.528	0.000

Statistical difference is significant between two groups from 12th months based on height, but there is no significant based on weight

Table 2: The comparison of (Mean±SD) Girls children weight and height in villages of Gorgan between 1997 and 2004

	1997 (1330 person)			2004 (1377 person)				
Age (months)	No.	Weight (kg)	Height (cm)	No.	Weight (kg)	Height (cm)	t-test (PV) weight	t-test (PV) height
0-12	299	7.29±2.2	64.67±7.9	342	7.00±2.02	64.33±8.4	0.070	0.602
12-24	234	10.83±2.5	77.57±6.4	273	10.37±1.60	79.04±6.2	0.015	0.008
24-36	244	13.01±3.3	86.00±6.7	264	12.45±1.60	87.80±6.7	0.013	0.002
36-48	249	14.20±2.0	92.25±7.1	265	14.30±1.80	95.30±6.4	0.535	0.001
48-60	304	15.83±2.1	99.34±7.1	233	15.96±2.30	102.36±6.5	0.323	0.012

Statistical difference is significant between two groups from 12th months based on height and there is significant at 12-24 and 24-36 months age groups based on weight

Table 3: The comparison of malnutrition based on underweight in villages of Gorgan between 1997 and 2004

	1997			2004			
Criteria	Boys n (%)	Girls n (%)	Total n (%)	Boys n (%)	Girls n (%)	Total n (%)	χ^2 test (Pv)
-1sd	392(29.9)	364(27.4)	756(28.6)	376(25.4)	382(27.7)	758(26.5)	0.07
-2sd	78(6)	73(5.5)	151(5.7)	53(4.6)	69(5)	122(4.3)	0.01
-3sd	13(1)	13(1)	26(1)	8(0.53)	13(0.94)	21(0.73)	0.31

Statistical difference is significant between two stages about -2sd criteria

Table 4: The comparison of malnutrition on based on stunting in villages of Gorgan in between 1997 and 2004

	1997			2004			
Criteria	Boys n (%)	Girls n (%)	Total n (%)	Boys n (%)	Girls n (%)	Total n (%)	χ^2. test (Pv)
-1sd	671(46.3)	616(51.3)	1287(48.8)	515(32.8)	479(34.8)	994(34.5)	0.001
-2sd	394(30.1)	403(30.3)	797(30.2)	198(13.4)	211(15.3)	409(14.3)	0.001
-3sd	203(15.5)	201(15.1)	404(15.3)	66(2.5)	78(5.7)	144(5.0)	0.001

Statistical difference is significant between two stages about all of criteria

Table 5: The comparison of Malnutrition on based on Wasting in villages of Gorgan in between 1997 and 2004

	1997			2004			
Criteria	Boy n (%)	Girl n (%)	Total n (%)	Boy n (%)	Girl n (%)	Total n (%)	χ^2 test (Pv)
-1sd	310 (23.8)	262 (19.7)	572 (21.7)	276 (18.6)	282 (20.5)	558 (19.5)	0.04
-2sd	50 (3.8)	51 (3.83)	101 (3.82)	39 (2.63)	46 (3.34)	85 (2.97)	0.08
-3sd	6 (0.46)	9 (0.68)	15 (0.57)	4 (0.27)	9 (0.65)	13 (0.45)	0.50

Statistical difference is significant between two stages about -1sd criteria

Underweight, stunting and wasting reduced 0.2, 2.27 and 0.12%, respectively in each year from 1997 to 2004.

Prevalence of malnutrition based on -2sd in all of criteria except underweight in 1997, for two stages in girls is more than boys.

DISCUSSION

In this part, the changes of weight, height and prevalence of the malnutrition based on underweight, stunting and wasting for two stages (1997 to 2004) and for each year during period are discussed. These indexes are compared with other researches.

One of the outstanding results of this study is significantly improvement of height growth and changing weight growth after 7 years in Gorgan district. Despite stunting was markedly declined in 2004 but wasting and underweight had slightly changed.

Filho and Rissin (2003) in Braril, reported that the correction of height deficit was 72% in urban children and 54.4% in rural children after a 20 years period. Grummer *et al.* (1996) among preschool children between two stage studies showed that height deficit decreases from 28 to 22% and weight deficit decreased from 15 to 10.5%. Pinchinat *et al.* (2004) in Senegal, reported that after 23 years nutritional intervention, in spit of decreasing of mortality, weight growth pattern has not changed.

Stunting is one of the most health problem in this area and significantly decreased after 7 years. Other studies showed that children in this area suffer from stunting than underweight. Sayari's (2000) study on the under 5 years old children showed that Golestan province (this area) have the 1st and 13th position based on mean of weight and height, respectively, among 28 provinces of Iran. Veghari (2003) showed that children in this region suffer from stunting than underweight. UNICEF (Bellamy, 1998) reported that 226 million and 183 million of under 5 years old children in word suffer from stunting and underweight, respectively. Kwena *et al.* (2003) observed stunting more than wasting in pre-school children in a rural area in western Kenya. Gillespie *et al.* (1993) and Villalpando *et al.* (1992) obtained results such as present study in their survey. They announced that improvement in social-economic, public health promotion and decrease poverty were some factors effect on prevention of malnutrition. Wright *et al.* (2006) and Olsen *et al.* (2006) showed that not only food habituation but also social economic factors effect on prevention of malnutrition.

The prevalence of underweight, stunting and wasting were declined 1.4, 15.9 and 0.85%, respectively from 1997 to 2004. Globally (Lang, 1998; Stephenson *et al.*, 2000) stunted growth has declined from 49% of children under 5 years in 1980 to 40% in 1995. WHO announced that the prevalence of stunting in developing countries declined from 36% (1995) to 32.5% (2000). Gartner *et al.* (2007) in a poor urban districts in Senegal, showed that stunting and wasting decreased, 4.3 and 5.1%, respectively after food supplementation during 18 months. Svedberg (2006) reported that in India the prevalence of child stunting hasn't changed in the 1990s and in China, there was a significant increase in child stunting between 1987 and 1992 and then a declined by half up to 1998. Hoffman and Lee (2005) among under 7 years old in Korea reported that the prevalence of wasting has decreased from 16.5% (1997) to 8.2% (2002), but the prevalence of stunting has not changed during these years (38.2 vs 39.4%). De Onis (2000) reported that the prevalence of stunting has fallen in developing countries from 47% in (1980) to 33% in (2000). Stunting in Gorgan children declined threefold of what ever was estimated by WHO.

In this study, stunting dramatically decreased (2.27%) in each year during period. Lang (1998) reported that all of the regions in the developing countries except sub-Saharan Africa made some progress in reducing

stunted growth among children under 5 during 1980 to 1995. According on this report, stunting reduced from 0.9% in Southeast Asia to 0.3% in Mexico, Central America and the Caribbean in each year. Stunting increased about 0.13% in sub-Saharan Africa in this period.

Of the 25 countries in the sub-Saharan region with data available, however, 13 made substantial progress, but in 12 countries, the rate of stunting got worse. We can claim that stunting among Gorgan children improved more than developing countries children in each year the period.

The prevalence of underweight, stunting and wasting observed 4.3, 14.3 and 2.97%, respectively in 2004.Others reported underweight, stunting and wasting in their research: Monárrez-Espino *et al.* (2005) in Mexico 3.2, 22.3 and 1.1%, respectively, Singh *et al.* (2006) in western Rajasthan in India 60, 25 and 28%, respectively, Li *et al.* (2007) among under 18 months children in China, 19.5, 16.4 and 6.7%, respectively, Zoakah *et al.* (2000) in Nigeria, 23.7, 34.9 and 11.1%, respectively. The prevalence of underweight, stunting and wasting among Gorgan's children in 2004 were less than above countries children.

Sheikholeslam *et al.* (2004) in Iran showed that after nutritional intervention among under 5 years old children in three provinces, height and weight growth pattern improved significantly but there hasn't any change in these indexes in other provinces. Other studies (Brown, 2003; Singh, 2004; Gopaldas, 2005; Brown *et al.*, 2002; Sandstead *et al.*, 1998; Malekafzali *et al.*, 2000; Melville *et al.*, 1995) showed that food fortification and nutritional intervention can caused improving of the secular growth.

After first study (1997) and Sayari's *et al.* (2000) about growth failure in this area, Iranian Ministry of Health announced that Protein Energy Malnutrition (PEM) and trace elements deficiency as iron, zinc and folic acid can caused this situation.

Although we did not have any nutritional intervention in this area but local health managers employed some activities such as health education, step up Primary Health Care, expansion of vaccination, prevention of infectious disease and food fortification for solving this problem. These health interventions can cause improvement of physical growth in this area.

We observed in comparison with boys, malnutrition in girls is more. Others (Vailaya and Rai, 1996; Far *et al.*, 2004; Nojoomi *et al.*, 2004; Li *et al.*, 2007; Singh *et al.*, 2006) in their study reported the same results.

Briefly the results of this study showed that the prevalence of overweight, stunting and wasting declined during 7 years (1997 to 2004). Height improved more than weight among children in this region. Some health strategy that carried out by health managers in this area can caused this situation. Further studies are necessary to fallow the physical growth among children in this region.

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