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ORIGINAL ARTICLE

Impact Of Ethnicity Upon Body Composition Assessment In Iranian Northern Children

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ABSTRACT

Objective: This study was designed to determine secular growth among rural children between two ethnic groups (Sisstanish and Non-Sisstanish) in north of Iran.

Methods: We chose 20 villages from 118 by cluster and simple sampling. All of 25-60 months old children in this area were considered in this study. Sample size was 1569 cases (632=Sisstanish and 937=Non- Sisstanish). Height, weight and personal identification were recorded by questioner. BMI percentile and under -1sd, -2sd and -3sd from NCHS were used for comparison. χ^2 test and T.test were used to analyze by software SPSS.

Results: Sisstanish children were 900 g lighter and 4.39 cm taller than non-Sisstanish among all of age groups. T.test is significant between two groups based on weight and height ($P<0.05$). Stunting and underweight were observed in Sisstanish group 23% and 5.9% respectively more than in non-Sisstanish by -2sd criterion. There is a significant difference between two groups by stunting ($P<0.05$). Overweight (1.52%) and obesity (12.4%) were shown in Sisstanish group more than in non-Sisstanish group and Statistical differences is significant between them based on obesity ($P<0.05$).

Conclusion: Secular growth in two groups is disproportionate and in Non-Sisstanish group is better than Sisstanish group. Sisstanish children suffer from severe height deficit and BMI high. Thereby, malnutrition is the most health problem in rural area in the north of Iran and nutritional intervention is necessary for solving these problems.

Key Words: Height, Weight, Children, Ethnic, Iran

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Introduction

Human health depends on both genetics and ecological factors but second factors is more effective than the first one [1],[2].

World children suffer from Protein Energy Malnutrition [3] and UNICEF [4] reported that one-third of children were stunting in development countries in 2000. Obesity is another health problem in world [5]. Several studies in different countries [6],[7],[8],[9] showed obesity trend increases in world. Some agents affect on obesity, such as metabolic factors, low physical activity, high TV watching , computer playing, high calorie diet and high income [9],[10],[11],[12],[13],[14],[15] .

Growth monitoring is one of the important method to detect malnutrition and growth disorders in children [16].Anthropometry is universally

applicable, inexpensive and non-invasive method. It is available to assess of the proportion of size and composition of the human body. It shows both health and nutritional status and it predicts performance of health and survival. Short stature and underweight causes disability. High BMI (Body Mass Index) percentile values in children can help us in identifying and selecting children at risk and in assigning the children who will probably suffer from overweight or obesity in adulthood. This health information can help those children who are at risk and them need close monitoring or intervention.

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 be effect on the bodies metabolism and physical growth trend [17],[18]. Sayari [19] studies showed the high prevalence of malnutrition among Iranian children in 1996 and 1998. He reported that in comparison with 28 provinces, Golestan children's weight and height were in the first and thirteenth rank, respectively.. There isn't any concord between the trend of height and weight growth. Another study

[20] showed that children suffer from stunting more than wasting in this region. Obesity in Iranian children is as a health problem, too [21]. We carried out this study among 25-60 months age children in a rural area of Gorgan (Golestan province center). Gorgan district is a capital city and located in mountain-side in north of Iran and south east of Caspian Sea. The most of people living in this area are farmer and several ethnic groups living in this region. The main ethnic groups are: Fars(native), Turkman and Sisstani..of 9576 of people living in this area are 25-60 months age [22]. Sisstanish people who had immigrated from south-east to north of Iran about 30 years ago. Due to the restriction in executing epidemiological projects, there was not any study on the secular growth differentiation between ethnic groups in this area up till now; therefore it was necessary to design a research project about it. The aims of this study is to examine the trend of secular growth , underweight , stunting and BMI status among 25-60 months age children between two ethnic groups.

Material and Methods

This study is a descriptive-crosssectional that carried out in villages of Gorgan (North of Iran). Villages were chosen by cluster and simple sampling. We have chosen 20 villages from 118. All of the 25-60 months age children were chosen as a sample. Data was collected by health system staffs in this region. The number of samples was 1569 cases (632=Sisstanish and 937=Non-Sisstanish). Height, weight and birth date were recorded. Children's height was measured in a standing posture without shoe and 4 parts of body (heel, scapula, back of the head) attached to the wall. The weight, without clothes and shoes, was measured with scales confirmed by WHO. Weight and Height were measured with 0.1 kg and 0.1 cm accuracy [23]. The collected data was compiled and fed into computer and the Statistical Package for Social Sciences Package version 13, was used to analysis. The National Centers for Health Statistical (NCHS) [24],[25] standard was used for comparison the groups. Under 2 standard deviation (-2SD) from median of normal community (NCHS) computed as a start point of malnutrition (26,27) .Anthropometric Indexes in this study were defined following scale: Underweight: weight-for-age. Stunting: Height-for-age. BMI: weight-for -height square.

The BMI percentiles [28],[29] were used to classify subjects as follows: under weight, <5th BMI percentiles; healthy weight, 5th-84th BMI

percentiles; overweight, 85th-94th BMI percentiles; or obese, ≥95th BMI percentiles.

In this study the ethnicity was defined as follow: Sisstanish ethnic group: This group have immigrated from Sisstan and Bluchestan province (Locate in South east of Iran) to this area are residing in a particular rural area. Non-Sisstanish ethnic group: People who are resided in this region since long time ago. Chi-2 test and T.test were used for comparison of frequency and mean of groups respectively. Statistical significance was defined as P-value <0.05.

Results

Sisstanish boys are 900 g lighter and 4.7 cm shorter than non-Sisstanish boys [Table/Fig 1] .The mean of BMI is more than in Sisstanish group (0.5 kgm⁻²). There is a statistical significant differences between two ethnic groups based on weight and height in all of age groups as well as for all boys ages combined. T,test is significant only in 37-48 months old based on BMI criteria.(P<0.05).

Sisstanish girls are 400 g lighter and 4.1 cm shorter than non-Sisstanish girls .The mean of BMI is more than in Sisstanish group (0.5 kgm⁻²). There is a statistical significant differences between two ethnic groups from 37 months age by weight and from 31 months based on height and BMI in 37-48 months age .(P<0.05).

Stunting in Sisstanish boys based on -1sd ,-2sd and -3sd is 36%,24% and 8.6.% more than Non-Sisstanish boys respectively and Chi-2 test is significant between two groups in all of criteria (P<0.05) [Table/Fig 2] .Underweight in Sisstanish boys based on -1sd ,-2sd and -3sd is 24%, 4.3% and 0.3% more than Non-Sisstanish boys respectively and Chi-2 test is significant between two groups in all of criteria (P<0.05).

(TableFig 1)The comparison of mean and standard deviation of weight ,height and BMI by sex, age and ethnicity in north of Iran.

| Age (Mo) | Non_Sisstanish | | | | | | Sisstanish | | | | | | | | | |
|----------|----------------|-----------|------------|------------|-----|-----------|------------|------------|-----|-----------|------------|-----------|-----|-----------|------------|-------------------------|
| | Male | | | Female | | | Male | | | Female | | | | | | |
| | No | WT(Kg)a | HT(cm)b | BMI | No | WT(Kg)e | HT(cm)f | BMI | No | WT(Kg)a | HT(cm)b | BMI | No | WT | HT(cm)f | BMI (kgm ²) |
| 25-30 | 65 | 13.3(1.7) | 89.1(4.2) | 16.7(1.5) | 64 | 12.1(1.7) | 86.1(6.6) | 16.3(1.4) | 56 | 12.3(1.2) | 84.7(3.6) | 17.1(1.4) | 42 | 11.9(1.1) | 84.6(5.2) | 16.7(2.2) |
| 31-36 | 114 | 14.1(1.5) | 93.5(4.7) | 15.2(1.3) | 91 | 12.9(1.3) | 90.4(7.2) | 16.3(5.5) | 51 | 12.9(1.3) | 89.2(5.4) | 16.3(2.0) | 68 | 12.5(1.8) | 88.1(5.4) | 16.2(2.2) |
| 37-42 | 82 | 14.7(1.6) | 97.0(4.7) | 15.6(1.3)c | 63 | 14.4(1.8) | 96.4(4.9) | 15.4(1.4)k | 43 | 13.8(1.4) | 92.1(5.6)c | 16.4(1.6) | 61 | 13.4(1.5) | 91.0(5.0) | 16.1(1.5)k |
| 43-48 | 102 | 15.7(1.4) | 100.3(4.7) | 15.6(1.6)d | 84 | 15.0(1.9) | 98.9(4.8) | 15.3(1.5)l | 65 | 14.8(1.6) | 94.8(5.8)d | 16.5(1.7) | 57 | 14.3(1.6) | 93.7(8.1) | 16.7(3.9)l |
| 49-54 | 57 | 16.2(1.9) | 102.8(5.5) | 15.3(1.3) | 67 | 16.2(1.8) | 103.3(4.7) | 15.2(1.3) | 44 | 15.5(1.6) | 99.1(5.5) | 15.8(1.4) | 47 | 14.7(1.8) | 97.4(5.9) | 15.5(1.6) |
| 55-60 | 84 | 17.2(1.7) | 106.5(4.6) | 15.2(1.3) | 64 | 17.2(2.8) | 106.8(5.1) | 15.1(1.8) | 43 | 15.9(1.2) | 102.9(4.3) | 15.0(1.2) | 55 | 15.3(1.7) | 100.5(6.6) | 15.2(1.6) |
| Total | 504 | 162(2.0) | 98.1(7.2) | 15.8(1.5) | 433 | 14.5(2.6) | 96.7(9.0) | 15.6(2.9) | 302 | 14.1(1.9) | 93.4(7.8) | 16.3(1.7) | 330 | 13.7(2.0) | 92.6(8.0) | 16.1(2.4) |

WT=Weight HT=height BMI=Body Mass Index ()=standard deviation
 a= T.test is significant between two groups in all of ages (P<0.001)
 b=T.test is significant between two groups in all of ages (P<0.001)
 c= T. T.test is significant between two groups (P<0.005)
 d= T.test is significant between two groups (P<0.001)
 e= T.test is significant between two groups from 37 months old and combined age (P<0.001)
 f=T.test is significant between two groups from 37 months old and combined age (P<0.001)
 k= T.test is significant between two groups (P<0.001)
 l= T.test is significant between two groups (P<0.001)

(TableFig 2)The comparison of malnutrition between tow ethnic groups by stunting and underweight among 25-60 mounths old children in north of Iran.

| Ethnicity | No | Female N(%) | | | | | | No | Male N(%) | | | | | |
|----------------|-----|-------------|----------|--------|-----------|-----------|----------|-----|-------------|---------|--------|-----------|-----------|---------|
| | | Underweight | | | Stunting | | | | Underweight | | | Stunting | | |
| | | -1sd a | -2sd b | -3sd c | -1sd e | -2sd f | -3sd g | | -1sd h | -2sd k | -3sd c | -1sd l | -2sd m | -3sd n |
| Sisstanish | 330 | 157(47.4) | 36(10.9) | 5(1.5) | 189(57.3) | 104(31.5) | 41(12.4) | 302 | 140(46.4) | 19(6.3) | 2(0.7) | 169(56.0) | 92(30.5) | 29(9.6) |
| Non_Sisstanish | 433 | 118(27.3) | 16(3.7) | 3(0.7) | 93(21.5) | 30(6.9) | 8(1.8) | 504 | 112(22.4) | 10(2.0) | 2(0.4) | 103(20.4) | 33(6.5) | 5(1.0) |
| Overall | 763 | 275(36.0) | 52(6.8) | 8(1.1) | 282(37.0) | 134(17.6) | 49(6.4) | 806 | 253(31.4) | 29(3.6) | 4(0.5) | 271(33.7) | 125(15.5) | 34(4.2) |

a = X² is significant between two ethnic groups (P<0.001)
 b= X² is significant between two ethnic groups (P<0.001)
 e = X² is significant between two ethnic groups (P<0.001)
 f= X² is significant between two ethnic groups (P<0.001)
 g= X² is significant between two ethnic groups (P<0.001)
 h = X² is significant between two ethnic groups (P<0.001)
 k = X² is significant between two ethnic groups (P<0.002)
 l= X² is significant between two ethnic groups (P<0.001)
 m= X² is significant between two ethnic groups (P<0.001)
 n = X² is significant between two ethnic groups (P<0.001)
 c= There is no enough subject for X² test.

(Table/Fig 3) The comparison of BMI distribution among 25-60 mounths old children in north of Ir an on based of NCHS percentils

| Ethnicity | Male N(%) | | | | | Female N(%) | | | | |
|----------------|-----------|-----------|-----------|----------|-----------|-------------|-----------|-----------|---------|-----------|
| | No | <5% a | 5-84% | 85-94% | 95%< b | No | <5% c | 5-84% | 85-94% | 95%< d |
| Sisstanish | 302 | 103(34.1) | 80(26.5) | 42(13.9) | 77(25.5) | 330 | 90(27.4) | 90(27.3) | 22(6.7) | 128(38.9) |
| Non_Sisstanish | 504 | 220(43.7) | 146(28.9) | 53(10.5) | 85(16.9) | 433 | 176(40.6) | 123(28.5) | 28(6.4) | 106(24.5) |
| Overall | 806 | 323(40.1) | 226(28) | 95(11.8) | 162(20.1) | 763 | 266(34.7) | 213(27.9) | 50(6.6) | 234(30.7) |

a= X² is significant between two ethnic groups (P<0.007)
 b= X² is significant between two ethnic groups (P<0.003)
 c= X² is significant between two ethnic groups (P<0.001)
 d= X² is significant between two ethnic groups (P<0.001)

Stunting in Sistanish girls based on -1sd, -2sd and -3sd is 35.6%, 24.6% and 10.6% more than Non-Sistanish girls respectively and Chi-2 test is significant between two groups in all of criteria ($P < 0.05$). Underweight in Sistanish girls based on -1sd, -2sd and -3sd is 27.3%, 7.2% and 0.8% more than Non-Sistanish girls respectively and Chi-2 test is significant between two groups in -1sd and -2sd criteria ($P < 0.05$). There is insufficient number about -3sd for χ^2 test by underweight.

BMI > 95% in Sistanish boys is 8.6% and BMI equal 85-94% is 3.4% more than non-Sistanish. BMI > 95% in Sistanish girls is 14.4% and BMI equal 85-94% is 0.3% more than non-Sistanish. Statistical differences is significant between two groups based on BMI > 95% ($P > 0.05$) [Table/Fig 3].

Discussion

Stunting and underweight are two health problems among northern children of Iran. They suffer from stunting more than underweight. Overweight and obesity are other problems in this area. Other researchers reported under and over nutrition in their studies [30],[31],[32],[33]. Sayri [19] study on the under 5 years old children among 28 provinces in Iran showed that Golestan province has the 1st and 13th ranks by weight and height growth respectively. Shykhholeslam [34] and Rounaghi [35] founded trace elements deficiency in some areas of Iran. Prevalence of malnutrition in Sistanish group is higher than Non-Sistanish group. Other studies [33],[36],[37],[38] showed that ethnic groups in a community have nutritional variety together. Several factors, like culture, economy, literacy, food habit and poor health can effect on nutritional situation in an area [32], [33], [38].

Mean of weight and height of Sistanish children is lower than Non-Sistanish but obesity in Sistanish group is higher than Non-Sistanish. Danubio [39], Freedman [40] and Ogden [8] in United States reported the difference in prevalence of obesity among ethnic groups. Wickramasinghe [41] in his study showed that genetic factors effect on secular growth and we should consider them in anthropometry. Rush [42] recommended using FFM (Free Fat Mass) instead of BMI in field study. Fredriks [43],[44] believes that separate Growth Chart is necessary for Moroccan and Turkish children that living in Netherlands.

The results of this study showed that Sistanish children are overweight and obese, despite high prevalence of stunting. Further studies are necessary

for growth monitoring with regard to ethnicity in this region. Several micronutrients, like zinc, iron, iodine, selenium, vitamin A, B12 and B9 take part in structure of some enzymes, hormones and their activities. Lack of mentioned nutrients can change the body metabolism and physical growth trend [17],[18],[45]. Somatic growth in boys is better than girls. Others [46],[47] reported that prevalence of malnutrition in girls is higher than boys.

Finally, this study shows that underweight, stunting and obesity are as health problems among children in north of Iran. Various races have different nutritional problems. Nutritional status in non-Sistanish group is better than Sistanish. With regard to high prevalence of under nutrition and high prevalence of obesity among Sistanish children, BMI criteria doesn't have an enough acceptability to determine obesity in population with height deficit. Although malnutrition resulting from height failure in Sistanish children is higher than non-Sistanish children, but high prevalence of obesity among Sistanish children is a question that we should answer it. We don't know what causes this problem. We suppose that Sistanish children are either genetically shorter in stature, malnourished or some combination of these factors when are compared to the non-Sistanish children. These data show that comparisons of anthropometric measurements with an international standard, like NCHS standard, is only a part of the view that healthcare professionals and nutritionists must take. Local ethnic, genetic and other factors are also at play and need to be emphasized before proper healthcare measures can be under taken.

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