Underweight, overweight and obesity in the children residents in the amazons forest (Peru).

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Originales

ABSTRACT

Objectives. To analyze the anthropometric parameters according to age and sex, and to describe the prevalence of overweight and obesity in a young population that because of geographical reasons has very difficult access to the sanitary services.

Methods. We studied 255 children, aged 1 to 13 years, from a population of the low forest of the Amazon river (Loreto, Peru), and observed the following variables: weight, height and bicipital, tricipital, subscapular and suprailiac skinfold thickness.

Results. The prevalence of underweight was 15.5% (CI 95%: 9.7% - 22.9%) in girls and 1.6% (CI 95%: 0.2% - 5.6%) in boys. The difference of prevalence between the sexes was statistically significant PD: 14.0% (CI 95%: 7.3% – 21.2%; p=0.00008). Overweight was observed in 8.7% (CI 95%: 4.4% – 15.1%) and 1.6% (CI 95%: 0.2 – 5.5%) of the boys and girls, respectively. The difference of prevalence between the sexes was statistically significant PD: 7.2% (CI 95%: 1.8% – 12.5%; p=0.009).

Discussion and Conclusion. We can conclude that differences exist in the prevalence of underweight and overweight between the masculine and feminine genders in the low forest of the river amazons (Peru); being the prevalence of underweight but risen in girls and a prevalence of overweight but risen in boys.

Keywords: Running Head: Underweight and overweight in Amazon forest

INTRODUCTION

In the last two decades the obesity has been constituted in a problem of public health in the developed countries[2]. While in other countries of the world the malnutrition and underweight continue being the main source of problems of health[1]. Diverse authors[12], have documented that body mass index (BMI) varies by race and ethnicity, and there are important racial/ethnic differences in the relationship between BMI and psychosocial outcomes. Although some decisive aspects

for growth are subject to control by genetic factors, an improved socioeconomic state and the sufficient availability of nutrients, as well as overall health conditions, all have a crucial influence on normal growth and development. In the last two decades, the prevalence of overweight and obesity in North American children and adolescents has increased by 120% among the black and Hispanic population and by 50% in the white population[12].

The populations of various countries in Latin America are increasingly overweight or obese, a phenomenon that coexists with diverse degrees of undernutrition; such is the case of Peru, Bolivia, Nicaragua and Guatemala[1]. Peru is still categorized as a poor country with a high prevalence of communicable diseases. In almost one-half of these cases, the illness is complicated by malnutrition. The study population of school-age children in Peru show high and moderate prevalences of stunting and underweight[5].

The objective of the present study is to analyze and to describe the prevalence of underweight, overweight and obesity in a child population that because of geographical reasons has very difficult access to healthcare services. This geographic area includes the low forest, at the source of the river Tapiche, on the border with Brazil.

MATERIAL AND METHODS

Growth parameters were determined in 255 children aged 1-13 years. Their health was evaluated by a medical questionnaire and by physical examination; none of the subjects recruited for the study was ill at the time. Each parent or tutor of the participants, prior to granting consent, was informed about the procedures and the purpose of the study. The definitions used were those of the Center for Disease Control and

Prevention, under which 5 categories of body mass are established, based on the percentiles for each age and sex. Thus, underweight was defined as at or below the 5th percentile; 'normal' BMI was assumed to be between the 5th and the 85th percentiles; at risk of overweight was between the 85th and 95th percentiles; overweight was between the 95th and 97th percentiles + 2 BMI units, and obese was at or above the 97th percentile + 2 BMI units[13]. The study was approved by the Committee of ethics of our hospital area in Spain.

Figure 1. *Study area in the Amazon rainforest (arrow).*

Subjects

Children of Loreto (Peru). We recruited 255 children aged between 1 and 13 years (126 boys and 129 girls), resident in the region of Loreto (Peru) and representing practically the whole infant and child population of the zone, only 7 children (3 boys and 4 girls) they could not be included in the study by not being available in the moment of the measure. This geographic area includes the low

forest, at the source of the river Tapiche, on the border with Brazil (Figure 1). The following settlements were included in the

study: Limoncocha, Fátima, Pacasmayo, Yarina, Guikungo, Canchalagua, Morales Bermudez, Puerto Angel, San Pedro, Nueva Esperanza and Nuevo Progreso.

Anthropometry

Measurements included weight, height, and skinfold thickness at the triceps and biceps, and in the subscapular and suprailiac regions.

Weigh and height were determined using a digital electronic weighing scale (range 0.1-150 Kg) and a digital statiometer (range 60-205 cm) respectively. The anthropometric data was then used to calculate the body mass index (BMI, kg/m^2). Measurements were made by trained personnel first thing in the morning at the participant schools.

Skinfolds were determined to an accuracy of 0.2 mm by means of a calibrated Harpenden skinfold calliper exerting a constant pressure of 10 g/mm^2. Following the indications of Brook, the body density and the percentage of body fat were calculated using Siri's equation[4].

Statistical analysis

The SPSS 12.0 statistical package was used to calculate the percentiles of each variable by age and sex, and to carry out a regression study and establish the correlation among variables.

RESULTS

Tables 1 and 2 show the average values (CI 95%) for weight, height and BMI. The prevalence of underweight was 15.5% (CI 95%: 9.7% - 22.9%) in girls and 1.6% (CI 95%: 0.2% - 5.6%) in boys. The difference of prevalence between the sexes was

statistically significant PD: 14.0% (CI 95%: 7.3% – 21.2%; p=0.00008). The BMI (SD) of the children with underweight it was of 13.8 (1.0) Kg/m^2 in the girls and of 12.2

(0.01) Kg/m^2 in the boys. The percentage of corporal fat (SD) of the children with underweight it was of 11.6% (2.7), we don't observe significant differences in the percentage of corporal fat between children with underweight and without underweight (t=0.5; pNS), what suggests that the underweight in this group of children not takes place to expense of the corporal compartment fatty.

In our sample, 15.5% (CI 95%: 9.73% – 22.9%) of the boys and 10.1% (CI 95%: 5.48% - 16.6%) of the girls they are in risk of overweight. The difference of prevalence between the sexes it is not statistically significant. In our sample the BMI in the children between the 85th and 95th percentiles was of 19.8 (2.2) Kg/m^2 for the girls and of 17.4 (2.0) Kg/m^2 for the boys.

Overweight was between the 95th and 97th percentiles, in this group of our sample the BMI (SD) of the girls it was of 21.8 (6.3) Kg/m^2, and of 17.8 (1.1) Kg/m2 in the boys. Overweight was observed in 8.7% (CI 95%: 4.4% – 15.1%) and 1.6% (CI 95%: 0.2 – 5.5%) of the boys and girls, respectively. The difference of prevalence between the sexes was statistically significant PD: 7.2% (CI 95%: 1.8% – 12.5%; p=0.009).

Figure 2 shows the regression straight line between the bicipital and tricipital skinfolds with age. In all cases, we observed a statistically significant downward trend, with decreasing skinfold thickness with the age. This decrease was more marked in the boys. With respect to subscapular and suprailiac skinfold thickness, very slight increments were observed with age.
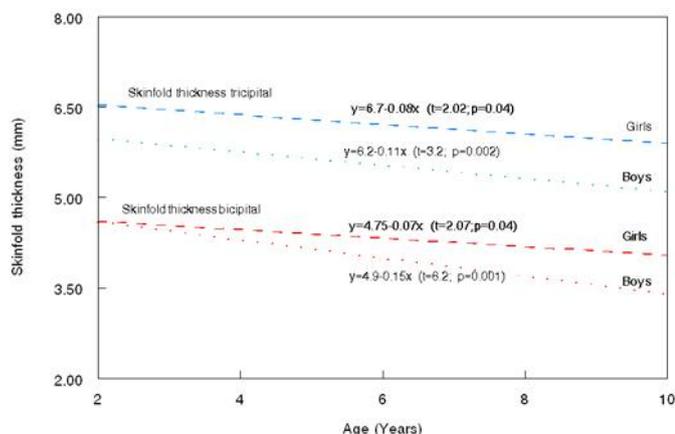
Figure 2. *Regression analysis between bicipital and tricipital skinfold thickness and age in boys and girls from Loreto county (Peru)*

DISCUSSION

Our results show that the prevalence of underweight in the infantile population of the low forest of the river amazons (Peru) it is bigger in the girls. Being same the risk of overweight in boys and girls, the overweight it is but it frequents in children than in girls. These results seem to indicate an unequal access to the alimentary resources between genders.

Our findings indicate that the prevalence of overweight in the low forest of the river amazons (Peru) it is smaller than the one communicated by other authors[2;15], in studies of populations that are geographically more accessible.

We observe differences statistically significant between the prevalence of overweight between girls and boys in our sample. Differences that have not been communicated by other authors in populations of Latin America[7] or in infantile populations of other by different authors[17] are probably due to multiple factors. Taylor et al. (14), found a prevalence of obesity of 10% in several ethnic groups, while the prevalence of obesity among Turkish children is 2.1% for boys and 2.6% for girls[10]. A higher prevalence of obesity has been found among African and Hispanic American children[10].

According to other authors[7], the prevalence of obesity and overweight in Peruvian school-age children is 6.4% slightly lower than that observed in the present study for the boys, but bigger than that of the girls of our sample.

In Latin America the tendency for obesity to rise is associated with poverty, mainly in marginal urban districts. Situation very different to the one observed in the forest areas, where the malnutrition and the transferable illnesses continue being the main cause of mortality[5]. In developing and developed countries obesity tends to decrease in inverse proportion to the per capita gross national income, especially among women[7].

Table 1

Value means and percentiles for the variable weight, height and body mass index (BMI) in a sample of children (males) of the Loreto County (Peru).

Years	N		Mean	S.D.	Percentiles						
					5	10	25	50	85	90	95
1	9	Weight	10.11	1.45	-	8.00	9.00	10.00	12.00	-	-
		Height	74.78	4.84	-	68.00	70.00	75.00	81.00	-	-
		BMI	18.21	3.00	-	13.06	16.17	18.55	22.07	-	-
2	7	Weight	11.71	1.49	-	9.00	11.00	12.00	13.00	-	-
		Height	84.57	3.15	-	81.00	81.00	84.00	88.60	13.00	-
		BMI	16.36	1.85	-	13.71	15.58	15.96	19.29	-	-
3	6	Weight	14.50	3.56	-	-	12.00	13.00	20.75	-	-
		Height	94.67	11.18	-	84.00	86.25	91.50	114.2	-	-
		BMI	16.17	2.52	-	12.24	13.92	16.44	18.88	-	-
4	12	Weight	15.50	1.33	-	14.00	14.25	15.00	17.05	17.70	-
		Height	98.58	4.03	-	93.30	94.25	99.50	103.1	103.7	-
		BMI	15.94	0.83	14.70	14.85	15.20	15.93	17.01	17.44	-
5	10	Weight	17.20	1.68	-	15.00	15.75	17.50	19.35	19.90	-
		Height	105.1	3.47	-	101.1	102.0	104.0	109.7	110.8	-
		BMI	15.54	0.94	14.41	14.44	14.77	15.14	16.87	17.23	-
6	10	Weight	18.50	2.67	14.00	14.20	16.75	18.50	21.40	23.60	-
		Height	108.6	3.50	102.0	102.4	106.7	108.0	113.1	114.7	-
		BMI	15.64	1.78	12.22	12.46	14.80	15.40	17.69	18.91	-
7	12	Weight	21.83	3.24	17.00	17.00	19.25	22.00	26.05	26.70	-
		Height	114.5	5.16	107.0	107.3	110.2	114.5	121.1	121.7	-
		BMI	16.65	2.44	14.04	14.20	15.36	16.23	18.05	21.83	-
8	15	Weight	22.83	3.16	18.00	19.20	21.00	22.50	25.20	28.40	-
		Height	118.7	5.13	110.0	110.6	115.0	120.0	125.2	126.4	-
		BMI	16.13	1.18	14.87	15.11	15.45	15.70	16.95	18.16	-
9	14	Weight	25.14	3.10	20.00	21.00	23.75	24.50	28.25	31.00	-
		Height	123.5	4.48	117.0	118.5	120.7	122.0	130.0	132.5	-
		BMI	16.45	1.40	13.00	14.14	15.82	16.40	17.51	18.38	-
10	10	Weight	27.20	2.34	-	-	25.00	26.50	30.35	30.90	-
		Height	129.3	3.36	124.0	124.2	126.0	129.5	133.4	33.90	-
		BMI	16.27	1.30	14.69	14.70	14.96	16.20	18.29	18.33	-
11	8	Weight	28.37	2.72	-	24.00	26.00	29.50	31.30	-	-
		Height	131.6	4.47	-	125.0	127.5	131.5	136.7	-	-
		BMI	16.33	0.66	-	15.36	15.74	16.21	17.16	-	-
12	6	Weight	32.75	4.33	-	28.00	29.50	31.50	39.78	-	-
		Height	136.7	5.04	-	130.0	133.0	136.0	144.7	-	-
		BMI	17.45	1.01	-	16.56	16.67	17.03	18.99	-	-
13	7	Weight	36.28	8.80	-	-	30.00	34.00	51.8	-	-
		Height	141.0	11.8	-	131.0	134.0	136.0	161.6	-	-
		BMI	18.00	1.19	-	16.21	17.34	17.82	19.73	-	-

Header row: **Boys - County of Loreto (Peru)**

Table 2

Value means and percentiles for the variable weight, height and body mass index (BMI) in a
sample of children (females) of the Loreto County (Peru).

Years	N		Mean	S.D.	Percentiles						
					5	10	25	50	85	90	95
1	4	Weight	8.75	0.95	-	8.00	8.00	8.50	-	-	-
		Height	73.00	2.94	-	70.00	70.50	72.50	-	-	-
		BMI	16.37	0.68	-	15.43	15.65	16.59	-	-	-
2	12	Weight	11.00	0.73	-	10.00	10.25	11.00	12.00	-	-
		Height	80.67	6.73	66.00	68.40	76.50	81.50	87.15	89.10	-
		BMI	17.21	3.14	-	14.53	14.91	15.79	20.00	23.59	-
3	10	Weight	12.60	1.89	-	10.00	10.75	13.00	14.70	15.80	-
		Height	90.50	3.06	85.00	85.10	89.00	91.00	93.70	94.80	-
		BMI	15.34	1.91	12.99	13.04	13.76	15.19	17.66	19.43	-
4	10	Weight	13.60	1.83	10.00	10.20	12.00	14.00	15.35	15.90	-
		Height	96.00	5.63	89.00	89.20	92.50	94.50	104.1	107.4	-
		BMI	14.72	1.31	12.62	12.72	13.68	14.45	16.34	16.57	-
5	15	Weight	17.26	3.80	13.00	13.60	15.00	17.00	19.80	24.20	-
		Height	105.4	3.39	-	100.0	103.0	106.0	109.6	110.4	-
		BMI	15.50	3.21	13.00	13.06	13.60	15.00	16.82	20.93	-
6	17	Weight	17.76	1.09	-	16.00	17.00	18.00	19.00	19.20	-
		Height	108.0	3.57	101.0	103.4	105.5	108.0	112.3	113.4	-
		BMI	15.28	1.47	12.85	13.54	14.07	15.42	16.79	17.44	-
7	6	Weight	19.33	1.63	-	-	18.00	19.00	21.90	-	-
		Height	112.2	2.92	-	-	109.0	112.5	115.9	-	-
		BMI	15.35	0.90	-	13.85	14.82	15.26	16.34	-	-
8	12	Weight	20.83	2.32	-	18.00	18.50	20.00	24.00		-
		Height	116.9	4.01	111.0	111.3	113.0	117.0	121.1	122.4	-
		BMI	15.20	1.07	13.88	13.95	14.35	14.73	16.42	16.78	-
9	13	Weight	24.84	3.29	17.00	19.00	23.00	25.00	28.00	29.20	-
		Height	127.2	5.03	120.0	120.8	123.0	127.0	135.5	136.0	-
		BMI	15.33	1.71	10.37	11.94	14.82	15.86	16.55	17.04	-
10	9	Weight	28.55	3.60	-	-	25.00	28.00	33.00	-	-
		Height	130.8	6.05	-	122.0	126.0	130.0	138.5	-	-
		BMI	16.62	0.76	-	15.50	16.06	16.56	17.71	-	-
11	12	Weight	29.87	5.00	24.00	24.60	26.12	29.50	33.5	40.00	-
		Height	132.8	4.63	127.0	127.3	130.2	132.0	136.5	142.3	-
		BMI	16.84	1.62	14.64	14.74	15.47	16.92	18.48	19.82	-
12	7	Weight	34.71	6.70	-	27.00	29.00	35.00	45.40	-	-
		Height	139.9	6.81	-	131.0	132.0	140.0	149.4	-	-
		BMI	17.59	1.73	-	15.49	16.62	17.35	20.41	-	-
13	2	Weight	45.50	0.70	-	-	45.00	45.50	-	-	-
		Height	146.5	4.95	-	-	143.0	146.0	-	-	-
		BMI	21.22	1.10	-	-	20.44	21.22	-	-	-

In our sample, the skinfold thickness was found to diminish significantly with age reflection of the infantile population's nutritional state. In agreement with other authors[9;11], we found that the percentage of body fat among the children of the region of Loreto decreased progressively until the age of 6 years, after which the percentage of body fat increased progressively. Similar findings have been observed by Hesketh et al.[6] in Australian children and observed a prevalence of overweight and obesity of 19.7% and 4.8% respectively, with higher rates among girls than boys.

On the basis of the present results, we can conclude that differences exist in the prevalence of underweight and overweight between the masculine and feminine genders in the low forest of the river amazons (Peru); being the prevalence of underweight but risen in girls and a prevalence of overweight but risen in boys.

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