"Quito municipal schools" cohort study: Baseline results

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ABSTRACT

The lack of population-level data on growth and development of children and adolescents in Ecuador, and the existence of previous data suggesting an alarming increase in the numbers of children presenting overweight or obesity justifies the present cohort study which includes all pupils of municipal schools of Quito aged 9 to 17 years. Follow-up will continue for a minimum of 7 years. This will allow determining the evolution of prevalence of these phenomena and their trends as well as other indices, both physiological and family-related customs, in order to plan appropriate preventive interventions. The present cross-sectional study includes 21 municipal schools, grouped into four health zones, each of which depends on a health centre, also municipal, and which are responsible for the health of pupils in these schools. Of the 6964 pupils studied, 18.7% suffer overweight and 7.9% obesity: 19.3% and 9.7% respectively in boys, compared to 18.2% and 5.4% in girls. The study also assesses family characteristics, degree of sedentarism and nutritional habits: 62.3% declared living in a nuclear family, and 60.5% declared their families to be in the "adolescent" lifecycle stage; 91.9% of pupils were sedentary while 5.4% ($CI_{95\%}$ 4.87 - 5.94) reported not eating breakfast every day.

Keywords: Overweight and Obesity; Equatorian School Children; Sedentarism; Type of Family

1. INTRODUCTION

Obesity has become a worldwide public health problem in the last few years [1]. Non-communicable diseases have been among the leading causes of death since the end of the 1990s [2]. Child obesity perpetuated into adolescence and adult ages leads to a serious condition associated to changes in food culture and transformations of a social nature such as physical activity giving way to sedentarism [3]. Many countries in the Americas, have seen a rise in the prevalence of overweight and obesity [4] for several years [5]. Unfortunately there is no more information available to be related nor compared in the same scheme.

In Ecuador the scarcity of studies on overweight and obesity in children and teenagers has aroused the interest of national and local authorities. The Quito Metropolitan District Municipality (QMD) and the Family and Community Medicine postgraduate department of the Universidad Central del Ecuador (UCE) decided to join forces to design a longitudinal cohort study that would permit assessing the growth and development of young people aged nine to 17 years, which is the age range about which least is known.

The Ecuatorian government has established as priorities, through the Plan Nacional del Buen Vivir (National Plan for Healthy Living), to strengthen prevention, diagnosis and treatment of chronic degenerative diseases, in addition to designing and applying programs of information, education and communication which promote healthy environments and living habits [6].

Practically 100% of Quito school-age children go to school [7]. QMD is in charge, through the Subsecretary for Education, of a set of schools distributed through all the city zones. Every school has a medical team which does annual check-ups and provides permanent coverage, but it is the family doctor who is responsible for evaluation of the family setting in which the children are immersed. Given this scenario, the UCE Family and Community Medicine postgraduate department suggested including fundamental aspects, such as analysis of the family and its influence in the school context.

The aim of this article is to analyse the initiation of the cohort study in order to determine the baseline for subsequent analyses.

2. MATERIALS AND METHODS

2.1. Population

The study is being conducted in 21 schools of the Quito Metropolitan District. All students matriculated in these schools participate in the study. The school health teams have organized themselves into health zones: South, Centre, and North. For the purposes of the present study a fourth group of schools was created: these are schools which since the academic year 2010-2011 are in a process of organizational transition. We treat them as a "peripheral-area" because they are located in the transition area between urban and rural surroundings of Quito.

The research team of Quito was who collected the data and performed anthropometry, after standardization. The questionnaire was self-administered.

2.2. Inclusion Criteria

Pupils in their sixth to the tenth year of basic education, aged between 9 and 17 years, and present on the day the school was surveyed.

2.3. Exclusion Criteria

Failure to present consent signed by parents, or refusal by the pupil to participate. Pregnant girls were also excluded, as were pupils who through disability were unable to stand upright.

2.4 Ethical Considerations

The baseline work was approved by a team formed for this purpose. Delegates from the Ministries of Health and Education of the Municipality of Quito and the Academy participated. The protocol was submitted and approved in General Assembly of representatives of parents, students and teachers. Furthermore, prior to the implementation of the survey, a document explaining the objectives of the study was delivered to the families of the students and they returned it signed and with the explicit statement of participation for parents and students completed.

2.5. Variables

Classical anthropometric measurements such as weight, height, percent body fat, skin-fold thicknesses (biceps, triceps, subscapular) and calculation of body mass index have been used to evaluate the growth of pupils, focusing on diagnosis of overweight and obesity. This section also includes subjects' self-perceptions of weight.

Measurements are made in a normalized, standardized manner using Secca height-measuring equipment and Tanita scales. Waist and hip circumferences are also taken, and skin-fold thicknesses measured with calipers.

Based on this information, and the calculation of body mass index, pupils are classified into one of three categories: $<P_{85}$, overweight or obese. The classification criteria used are those described in reports by the WHO 2007 [8] and CDC 2000 [9]. Aspects of sexual maturity are evaluated through the self-reported presence of menarche (in girls) and self-reported Tanner scale stage.

The following aspects are analyzed based on answers to validated questionnaires:

1) Dietary aspects, including in particular breakfast habits, pattern of meals eaten during the day, and nutrients usually consumed. In the self-completed questionnaire, the pupils provide assessments of their eating habits, including whether and what they eat for breakfast, whether or not they eat the five necessary meals each day, as well as what they eat. Other aspects such as eating fast-foods or soft-drinks, etc. are also systematically coded [10,11].

2) Evaluation of subjects' physical activity levels in order to assess sedentarism, both at school and at home. To assess physical activity and sedentarism in the pupils daily lives we inquired about the times of carrying out different activities, whether physical or implying sedentarism, with the latter being assessed using the INTA scale [12].

3) Family setting, apart from information about sociocultural aspects, also evaluates the concepts of participant's family type and family life-cycle stage, in accordance with the definitions used by Family Medicine and Community Health [13].

The aspects mentioned above are complemented, from 2012 onwards, by blood levels of the following biochemical parameters: lipids, glucose, albumin and hemoglobin [14,15].

2.6. Posterior Evaluation

From 2012 onwards annual check-ups will be made of all pupils, following the same criteria as the initial cross-sectional study. Pupils will be followed for a minimum of seven complete academic years, incorporating the new pupils in each year, and considering the time and events contributed by pupils who change schools. Each school has a medical care team, whose function will be to administer the survey questionnaire and take anthropometric measures annually. Obviously, the pupils classified as at risk of overweight or obesity will immediately be subjected to an additional intervention.

3. STATISTICAL ANALYSIS

In this paper we describe categorical variables as percentages and associated confidence intervals, and crude rates of prevalence of overweight and obesity by sex and age, as well as rates standardized between different regions, standardised using the indirect method, as a crude ecological approximation of social determinants. The

software used was SPSS [16].

In the future given the design of the cohort, open at both ends, and considering that variables could represent recurrent events, we will use the appropriate counting process models, such as the Prentice-Williams-Peterson counting process (PWPCP), a method that considers these characteristics while allowing for changes in co-variates over time [17].

4. RESULTS

In the cross-sectional study, conducted during the academic year 2010-2011 a total of 7365 pupils were matriculated in the various schools. On the days when the survey took place, 250 (3.3%) of pupils were absent, nine refused to participate (0.1%), and eight (0.1%) figured as having left school.

For various reasons, 129 pupils who were interviewed and had their anthropometric measurements taken were not subsequently incorporated into the database for analysis. The reasons were: 124 had ages outside the range required by inclusion criteria, one had special needs, and four were pregnant; thus the final total of participants for analysis was 6964 (94.5%) pupils.

Levels of missing data in sections of the self-administered questionnaire ranged from 1.1% in the question about whom they lived with, through 9.7% for the age of their oldest sibling, up to 27.8% of non-responses in the question about whether they drank coffee for breakfast. Questions on sedentarism fell inside this range.

Analysis of the baseline status of the 6964 pupils showed that 18.7% were overweight and 7.9% were obese, according to WHO 2007 reference values. In **Table 1** prevalence of these two properties is described by age and sex. In terms of the CDC 2009 criteria, 15.6% of pupils were overweight, and 6.4% obese. The average percentage of body fat in those in whom it was assessed was 22.5%.

Standardized morbidity ratios (SMR) were obtained for each of the health areas, being standardized by the indirect method. The SMR for overweight and obesity were very similar, except for the Northern area which presented an 8% higher level of overweight than the reference level (SMR 1.08; $CI_{95\%}$ 1.07 - 1.09) and for obesity in the Central health area for which the level was 9% higher than the reference (SMR 1.09; $CI_{95\%}$ 1.08 - 1.1), both these values being statistically significant.

Perception of body-image was answered by 6545 pupils (93.9%); of these, 7.5% considered themselves overweight and 0.7% obese. Regarding declared ethnicity of participants, 81.6% defined themselves as of mixed blood. Regarding family type and life-cycle stage, 62.3% declared living in a nuclear family, and 60.5% declared their families to be in the "adolescent" stage. Analysis of the physical activity section showed that 91.9% of pupils were sedentary or did only light physical activity.

Table 1. Overweight and obesity WHO 2007 criteria in terms of age and sex.

Sex				BMI $<P_{85}$	BMI$_{overweight}$	BMI $_{obese}$	Total (N)
Boys	Age	9	n	39	10	17	66
			%	59.1	15.2	25.8	
		10	n	343	124	84	551
			%	62.3	22.5	15.2	
		11	n	402	143	75	620
			%	64.8	23.1	12.1	
		12	n	417	131	75	623
			%	66.9	21.0	12.0	
		13	n	442	117	58	617
			%	71.6	19.0	9.4	
		14	n	431	78	31	540
			%	79.8	14.4	5.7	
		15	n	109	16	5	130
			%	83.8	12.3	3.8	
		16	n	54	6	3	63
			%	85.7	9.5	4.8	
		17	n	37	6	1	44
			%	84.1	13.6	2.3	
	Total		n	2274	631	349	3254
			%	69.9	19.4	10.7	
Girls	Age	9	n	37	14	12	63
			%	58.7	22.2	19.0	
		10	n	320	85	34	439
			%	72.9	19.4	7.7	
		11	n	384	85	33	502
			%	76.5	16.9	6.6	
		12	n	526	135	42	703
			%	74.8	19.2	6.0	
		13	n	745	175	48	968
			%	77.0	18.1	5.0	
		14	n	610	132	20	762
			%	80.1	17.3	2.6	
		15	n	132	28	5	165
			%	80.0	17.0	3.0	
		16	n	60	10	3	73
			%	82.2	13.7	4.1	
		17	n	24	7	4	35
			%	68.6	20.0	11.4	
	Total		n	2838	671	201	3710
			%	76.5	18.1	5.4	

BMI: Body mass index. Specific percentiles for age and sex are used.

Regarding breakfasting habits, 5.4% ($CI_{95\%}$ 4.87 - 5.94) reported not eating breakfast every day, with evident differences between the sexes: 6.8% ($CI_{95\%}$ 6.0 - 7.6) among the girls, 3.7% ($CI_{95\%}$ 3.1 - 4.4) among the boys.

5. DISCUSSION

The fact of being a census-based study constitutes a

strength, since it has the advantage of total coverage allowing an in depth analysis of the population under study, yielding reliable and up to date results. The follow-up planned for a period of 7 years enjoys the support of both national and local governments, thereby ensuring the support of the participating institutions interested in the objective of obtaining growth curves specific to this age group.

Another strength of the study is the fact of having achieved the active cooperation of parents' associations, including the signing of informed consent by all parents of pupils participating in the study. This was achieved through meetings and assemblies involving parents and teachers.

It is the first time that coherent cohort data has been collected referring to Andean countries. Moreover, official classification based on WHO criterion shows that obesity and overweight are real problems requiring to be tackled urgently, but in the meanwhile proper definitions have to be developed in these countries in order to set up appropriately targeted intervention programs in the future [18, 19].

SMR results showed the necessity of a more efficient analysis in the future, such as a multilevel study, in order to introduce dependence of health regions in the problem being studied.

Another positive aspect relating to the data collected in the questionnaires is the fact that having been sent to the parents or tutor by the pupil means responses of the parent can be contrasted with those of the pupils.

The main weakness of the study is the use of a self-administered questionnaire, as this implies a certain risk of presenting biases in the interpretation, since answers are subjective and cannot be contrasted.

The database corresponding to participants in the study in the academic year 2010-2011 is the property of the Quito Metropolitan District City Council, and may be obtained free of charge from: http://graal.uab.cat/#!/Informes-técnicos_100

6. CONCLUSIONS

The cross-sectional study found that 26.6% of participants were overweight or obese, compared to the figure of 15% expected according to the WHO definition. The problem is even more serious in the younger children considered, among both boys and girls, as rates predicted by WHO were only reached among boys aged 15 and over, but not among the girls. This means an intervention program is required that takes account not only of these gender differences, but also of the gender differences found with respect to whether children had eaten breakfast before coming to school.

The high level of sedentarism in both sexes also indicates an urgent need to incorporate physical activities at school.

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