Department of Community Medicine and Public Health, Faculty of Medicine, University of Aden, Yemen.
Department of Physiological Sciences, Faculty of Dentistry, University of Aden, Yemen.
Department of Morphophysiology, Faculty of Dentistry, Medical Sciences University of Havana, Cuba.

Overweight/obesity and socioeconomic status in children from Aden governorate, Yemen, 2009

Sobrepeso/obesidad y nivel socioeconómico en niños de la enseñanza primaria de la provincia de Adén, Yemen, 2009

Mohammed Ali Hussein Badi[I], Bárbara Elena García Triana[II], René Suárez Martínez[III]

[I]PhD. Department of Community Medicine and Public Health, Faculty of Medicine, University of Aden, Yemen. e-mail: mohamedbadi1@yahoo.com
[II]PhD. Department of Morphophysiology, Faculty of Dentistry ¨Raúl González Sánchez¨, Medical Sciences University of Havana, Cuba. Department of Physiological Sciences, Faculty of Dentistry, University of Aden, Yemen. e-mail: barbara.garcia@infomed.sld.cu
[III]PhD. Department of Community Medicine and Public Health, Faculty of Medicine, University of Aden, Yemen. ¨Calixto García¨ Medical Sciences Faculty, Medical Sciences University of Havana, Cuba.

ABSTRACT

Introduction: overweight and obesity are escalating health problems in both developed and developing countries.
Objective: to verify whether overweight/obesity is related to socioeconomic status among primary school children in Aden Governorate, Yemen.
Methods: a cross-sectional study was performed on 1885 students, 6-16 years old, during 2009, selected by using multistage stratified random sampling technique. Body weight and height were measured directly; percentiles were identified for body mass index, based on the new World Health Organization growth reference

standards, 2007. A survey to the parents was applied to establish the socioeconomic status through the variables: type of school, family income per capita and educational level of parents.

Results: the prevalence of wasted was 10.1%, normal-weight 69.2%, overweight 12.7%, and obese 8.0%. There were statistically significant relationships between overweight/obesity and private school and high family income per capita. The prevalence of overweight/obesity was higher in children with high educational level of parents.

Conclusions: overweight/obesity in primary school children from Aden Governorate, Yemen is related to private school, high family income per capita and probably also to high educational level of parents. More research is needed on the influence of socioeconomic factors in children obesity in the country, which is essential to set up effective prevention policies.

Key words: overweight, obesity, socioeconomic status, children, income, educational level.

RESUMEN

Introducción: el sobrepeso y la obesidad son problemas de salud pública en ascenso en países desarrollados y subdesarrollados.

Objetivo: verificar si hay relación entre sobrepeso/obesidad y el nivel socioeconómico en niños de enseñanza primaria, provincia de Adén, Yemen.

Sujetos y métodos: se realizó un estudio de corte transversal durante el 2009, en 1885 estudiantes de 6-16 años, seleccionados por muestreo aleatorio estratificado politietápico. Se midió el peso corporal y la estatura; se identificaron los percentiles para el índice de masa corporal, según los nuevos estándares de referencia de la Organización Mundial de la Salud, 2007. Se aplicó una encuesta a los padres para evaluar el nivel socioeconómico que incluyó: tipo de enseñanza, ingreso familiar per cápita y nivel educacional de los padres.

Resultados: la prevalencia de desnutrición fue de 10.1%, de peso normal 69.2%, de sobrepeso 12.7%, y de obesidad 8.0%. Se obtuvo relación estadísticamente significativa entre sobrepeso/obesidad y la enseñanza privada y el alto nivel de ingreso familiar per cápita. La prevalencia de sobrepeso/obesidad fue superior en niños con padres de un alto nivel educacional.

Conclusiones: el sobrepeso/obesidad en los niños de enseñanza primaria de la provincia de Adén, Yemen, se relaciona con la enseñanza privada, el alto ingreso familiar per cápita y probablemente también con el alto nivel educacional de los padres, Es necesario realizar más investigaciones sobre la influencia de factores socioeconómicos sobre la obesidad en el país, lo cual es esencial para establecer políticas de prevención efectivas.

Palabras clave: sobrepeso, obesidad, estatus socioeconómico, niños, ingreso, nivel educacional.

INTRODUCTION

Overweight and obesity are escalating health problems in both developed and developing countries. The worldwide prevalence of overweight and obesity in children and adolescents aged 5-17 years is approximately 10%, with that of

obesity alone being 2-3%. Certain regions and countries have significant high levels of pediatric obesity, for example, more than 30% of children and adolescents in the United States of America (USA), and approximately 20% of those in Europe (higher in Southern Europe than in Northern Europe), are overweight or obese.[1]

Childhood obesity carries a greater risk of developing coronary vascular disease (CVD), hypertension, type 2 diabetes mellitus, respiratory diseases, and some cancers. There is a significant correlation between body mass index (BMI) and metabolic syndrome in children and adolescents. Childhood obesity is also associated with increased psychosocial impact and reduced quality of life, for example, decreased self-esteem and physical functioning for children, while their parents may undergo emotional distress due to the chronic concerns about their children's health.[2]

The main contributing forces in the increasing prevalence of overweight and obesity are believed to be increasing urbanization and the globalization of food markets. With rising incomes and urbanizing populations, physical activity levels tend to decline and diets increasingly shift to include foods with higher contents of saturated fats and sugars. [3]

The socioeconomic status has strongly been related to overweight/obesity. In the developed world, pediatric obesity is generally more common in children and adolescents from families of lower socioeconomic status, but the magnitude of these socioeconomic differences in prevalence is quite limited. In the developing world the picture is again more complex: higher socioeconomic status has usually been associated with higher risk of pediatric obesity, although as the epidemic progresses in the developing world, lower socioeconomic status may become more at risk for obesity. [4,5]

Some studies in Turkey, Pakistan and Egypt, shows that the prevalence of obesity is higher in urban than in rural areas, high family income, private school and high education levels. [6,7,8]

One study in Sana'a, Yemen, showed that overweight was 6.2% and obesity was 1.8%. The prevalence of overweight and obesity was higher among private school children, females, children with a sedentary lifestyle and children with family history of obesity.[9] There are no published data about socioeconomic factors implicated in the development of overweight/obesity in Aden governorate. The present study was conducted to verify whether overweight/obesity is related to socio-economic status among primary school children in Aden Governorate.

SUBJECTS AND METHODS

This was an observational, cross-sectional study. It was conducted among the primary school children in Aden Governorate, Yemen. Aden Governorate is located in the south and is one of the educational and economic centers in the country with 590 000 inhabitants (2005 census). The city is divided into eight districts (Al-Tawahi, Ma'alla, Crater, Khurmaksar, Al-Mansora, Al-Burayqa, Al- Shaikh Othman, and Dar Sa'ad). The education system in Yemen starts by the kindergartens for two years and continues with the primary education from grade 1 to 9, then followed by secondary education from grade 10 to 12. It can be continued to the university education.

The universe of this study included all of the primary school children, aged 6-16 years in Aden Governorate; the total number was 108982.[10] The calculated sample size was increased taking into account 20% of non-response rate. Therefore, the final sample size was 1885 children.

A multistage stratified random sampling was used. Four districts of Aden Governorate were selected by simple random sampling. Eight schools (6 public and 2 private), from the total 130 schools, were selected and the sample was distributed, with attention to proportional allocation by type of school (public or private), age and sex in each geographical area of the city, to obtain a representative sample of the target population (probability proportionate to the size of the population). The schools were numbered and chosen by using random tables. One class from each level in the school was randomly chosen in the selected schools. The children were selected from each school-record by a systemic random sampling technique.

The inclusion criteria: children who were pupils in one of the selected primary schools and whose parents submitted the informed consent. The exclusion criteria: children who were not included in the selected schools or were not expected to fulfill the required investigations (ex. children with disabilities), children who refused clinical examination or whose parents did not give the informed consent.

A structural self-administered questionnaire paper in Arabic language was sent to the parents to collect data about the socio-economic conditions of the family (family size, total family income and the educational levels of parents).

Family income per capita was calculated as: total family income in Yemeni rial (YR)/ total number of family members. It was classified according to the Yemeni family income (Ministry of Planning) into: low, intermediate and high.[11] The educational level of the parents was divided into: illiterate, read and write, primary, secondary and university.[12]

In the paper for the clinical examination of the children, data were recorded about age, grade and type of school (private or public) for each child. Anthropometric measures of weight and height were taken during children examination and the body mass index was calculated. BMI expresses the weight-for-height relationship as a ratio, that is, weight (in kilograms)/ [height (in meters)] ^{2}.[13] The measurements of body weight and height were carried out by the researcher together with the medical assistants in the school. Body weight (in kilograms) was measured to the nearest 0.1 kg by using an electronic scale (SECA; Japan). Body height was measured to the nearest 0.5 cm by using a stadiometer (SECA; Germany) as the children stood erect against a vertical wall, in the Frankfort plane, according to the published data.[14] BMI was classified into four categories to assess the nutritional status as: wasted (<3rd percentile), normal-weight ($\geq 3^{rd}$ <85th percentile), overweight ($\geq 85^{th}$ <97th percentile) and obese ($\geq 97^{th}$ percentile). This classification is in accordance with the last recommendations of the World Health Organization (WHO) Expert Committee in Overweight, and the last WHO growth reference standards were used.[15]
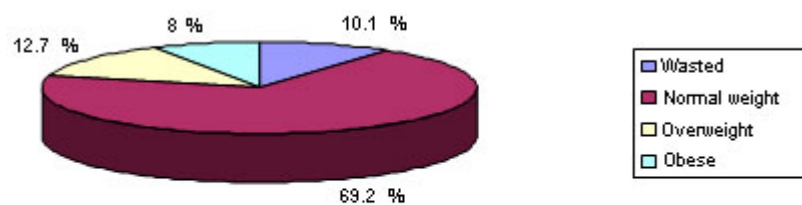
The questionnaire was pre-tested and subjected to Cronbach's Alpha program for reliability and item analysis, which gave a value of 0.80 (>0.70 is accepted).[16] The questionnaire was modified and finalized according to the results of pre-test, before starting the actual fieldwork. Twenty students were selected (not included in the studied sample) to calculate the intra-observer technical error of measurement. The values (0.1-0.3 for weight and 0.001-0.013 for height) were among the accepted ranges.[17]

Data were processed and analyzed by the SPSS software version 15 and the chi square test was used to determine the possible relationship between overweight/obesity and socio-economic conditions, with a significance level of 5% (P<0.05). T- test for independent samples was also used for comparing mean BMI.

Approval for the conduction of the study was obtained from the Faculty of Medicine and local authorities. Informed consents were obtained from parents. The students had the right to withdraw from the research at any time without giving the reasons.

RESULTS

The 1885 school children participants, aged between 6 to16 years had a mean age of 10.9 years. The results about nutritional status showed that the overall prevalence rate of the wasted was 10.1%, normal-weight 69.2%, overweight 12.7%, and obese 8.0 % (Figure 1).

Figure 1. Nutritional status of Aden primary school children. Yemen, 2009.

1. Overweight/obesity in relation to type of school

The prevalence of overweight/obesity was higher in private than public schools (25.5% and 18.9%, respectively; p<0.05). The mean±standard deviation BMI value, was also higher in private than public school children (p<0.05), (Table).
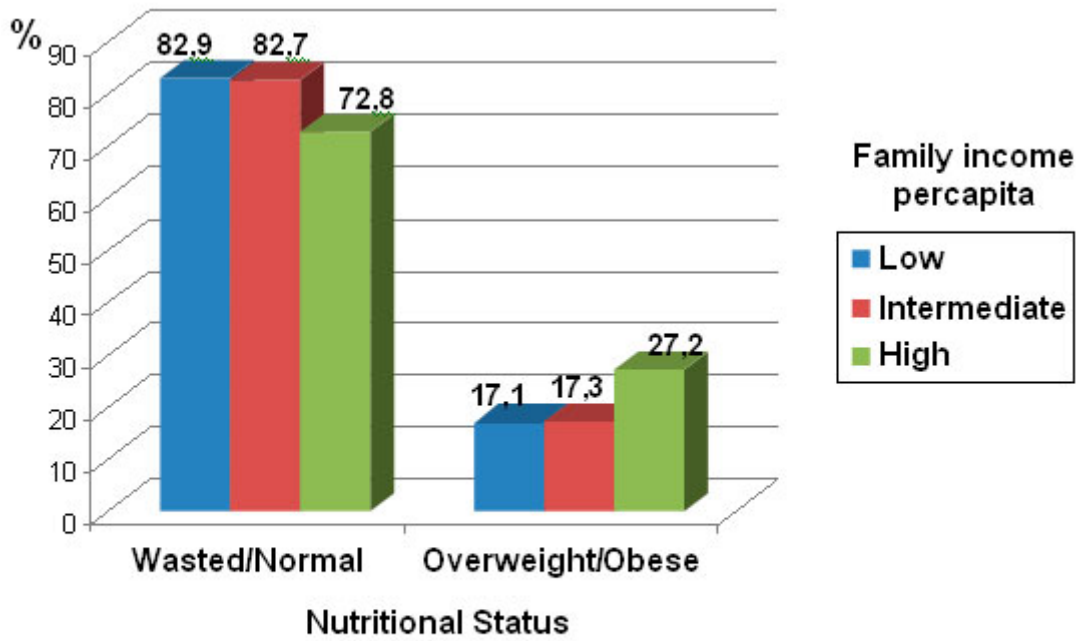
Table. Prevalence of overweight/obesity in Aden primary school children according to type of school, Yemen.

Type of school	Mean BMI ±SD (kg/m^2)	Nutritional status						Chi-square (p)
		Wasted/ Normal Weight		Overweight/ Obese		Total		
		No.	%	No.	%	No.	%	
Public	17,96±3.92	1122	81.1	262	18.9	1384	100	9.82 (.002)*
Private	18,86±4.43	373	74.5	128	25.5	501	100	
Total	18,19±4.08	1495	79.3	390	20.7	1885	100	

Note: Percentages by rows. BMI: body mass index, SD: standard deviation. (*) p<0.05, statistically significant. t- test for independent samples for comparing mean BMI (p< 0.05)

2. Overweight/obesity in relation to the family income per capita

There was a statistically significant relationship between the family income per capita and the prevalence of overweight/obesity in the children. High family income per capita children exhibited more prevalence of overweight/obesity (27.2% versus 17.1% low and 17.3% intermediate, Figure 2). The mean BMI was also greater in high family income with respect to the low and intermediate family income (p< 0.05).

Figure 2. Prevalence of overweight/obesity in Aden primary school children according to family income per capita, Yemen.

3. Overweight/obesity in relation to the educational level of the parents

Although the difference in overweight/obesity among children related to the educational level of parents was not statistically significant (p>0.05), there was a higher prevalence of overweight/obesity for the university educated fathers (24%) with respect to the illiterate, read-write, primary and secondary educational levels (16.3%, 18.2%, 16.9% and 20.9%, respectively). The educational level of the mothers also showed higher prevalence of overweight/obesity for the university mothers (26.0%) in respect to lower levels (15.9%, 20.7%, 20.4% and 21.5% for illiterate, read-write, primary and secondary, respectively).

DISCUSSION

This study is directed to provide data about the impact of socioeconomic conditions on overweight and obesity among primary school children in Aden Governorate. The results showed that the overall prevalence of wasting among primary school children in Aden Governorate was high (10.1%). On the other hand, the prevalence of overweight and obesity were also high (12.7% and 8.0%, respectively), as an expression of the double burden of malnutrition described for underdeveloped countries.[7]

In this study, the prevalence of overweight and obesity among the children was related to studying in private schools, high family income per capita and probably to parents' high educational levels. It was found that, the prevalence of overweight and obesity was higher in private than public school (Table) and it was similar to many studies in most Arab gulf countries, and India.[18,19] Because of the high annual fees in private schools (300-700 USD), the majority of the children come from families of moderate- to high-socioeconomic status, and this in the developing countries, has been associated to the consumption of unhealthy food in the school and house, and sedentary life with an increase in screen time (TV, video games).[18]

The prevalence of overweight and obesity was positively associated with a high family income per capita (Figure 2); and there was a tendency in the same direction for high educational levels (higher in university parents). This agrees with the findings of many studies in the Eastern Mediterranean Region (EMR) (Pakistan, Saudi Arabia, Kuwait, and India).[7,18,20] In contrast, in most of the developed countries, the prevalence of obesity increased in children specifically among minorities and low socioeconomic groups and is decreased in high level of education children (Germany, France).[21] Yemen is a country in a nutritional transition state, as in the EMR, overweight and obesity are related to high socioeconomic status as a result of the relationship between the family income and the level of education with changes in diet behavior and lifestyles. A higher socio-economical status of the family seems to be associated with the adoption of harmful habits, such as unhealthy diet and physical inactivity among family members.[22,23] Soft drinks consumption for example, is increased by family material wealth and higher parental occupational status.[24] A study has shown that the consumption of sugar-sweetened beverages is associated with obesity in children. Whereas a large breakfast may lead to a person eating a smaller lunch, this may not be true for sweetened beverages. There is evidence that sweetened beverages may not decrease caloric intake at other meals, causing an overall increase in caloric intake.[25]

An inverse relationship exists between educational background and BMI in the developed countries. Groups of subjects whose socioeconomic condition is less privileged do not necessarily have a lower energy intake than subjects in a higher financial bracket. Furthermore, some studies have indicated that an increase in income results more often in the purchase of foods whose preparation and packaging are more developed or whose quality is better, rather than in an increase of their quantity. This finding can be attributed partially to the fact that subjects who have completed a higher grade in school are more apt to follow dietary recommendations and to change their behavior to avoid risks than subjects who have a lower level of education. However, in the poorest population groups, diet tends to involve a higher number of calories and is characterized by a very high fat intake. Vegetables, fruits, and whole grain cereals, which are generally more expensive, are eaten in lesser amounts. [26]

CONCLUSIONS

This is the first study that shows a relationship between socioeconomic status and overweight/obesity in Aden children. Overweight/obesity in primary school children from Aden Governorate, Yemen is related to private school, high family income per capita and probably also to high educational level of parents. Better understanding of the influence of socioeconomic factors in the development of obesity in children is essential to set up effective prevention policies, including improvement of education levels and access to balance diet and proper physical activity. More research is needed on the behavioral and biological causes of overweight and

obesity, and on the prevalence among different regions and settings in the country. There is an urgent need to establish a plan of action to combat obesity in school children in developing countries.

ACKNOWLEDGMENT

REFERENCES

1. Katzmarzyk PT, Baur LA, Blair SN, Lambert EV, Oppert JM, Riddoch C. International conference on physical activity and obesity in children: Summary statement and recommendations. Int J Pediatr Obes. 2008; 3:3-21.

2. adran M, Laher I. Obesity in Arabic-Speaking Countries. J Obesity. 2011 Aug [cited 2012 Jan 21]: 2011 [about 9 p.]. Available from:
http://www.hindawi.com/journals/jobes/2011/686430/

3. World Health Organization [Internet]. Obesity and overweight. [updated 2010 Jan 27; cited 2012 Jan 18]. [about 2 screens]. Available from:
http://www.who.int/mediacentre/factsheets/ fs311/en/index.html

4. Reilly JJ. Obesity in childhood and adolescence: evidence based clinical and public health perspectives. Postgrad Med J. 2006 July; 82(969): 429-37.

5. Lobstein T, Baur L, Uauy R. Obesity in children and young people: a crisis in public health. Obes Rev. 2004 [cited 2012 Feb 21]; 5(suppl 1): 4-85. Available from: http://www.iaso.org/site_media/uploads/Report.pdf

6. Simsek E, Akpinar S, Bahcebasi T. The prevalence of overweight and obese children aged 6-17 years in the West Black Sea region of Turkey. Int J Clin Pract. 2008 Jul; 62(7):1033-8.

7. Warraich HJ, Faisal JF, Mohammed F, Khawaja FB, Saleem S. Prevalence of obesity in school-going children of Karachi. PLoS ONE [Internet]. 2009 Mar 24; [cited 2009 Nov 13]; 4(3): [about 9 screens]. Available from: http://www.Warraich H pakestan J.htm.

8. Kalishadi R. Childhood overweight, obesity, and the metabolic syndrome in developing countries. Epidemiol Rev Adv, [Internet]. 2007 May 3; [cited 2009 Mar 21]. [about 30 screens]. Available from: http://www.oxfordjournals.org/.

9. Yahia AR, Mabrook AM. Overweight and obesity among schoolchildren in Sana'a city, Yemen. Ann Nutr Metab. 2005; 49:342-5.

10. Statistical Department of Education Office, Ministry of Education, Aden. Yemen. 2008 Report. Aden: Ministry of Education 2008. p. 20.

http://scielo.sld.cu

11. University of Aden. Poverty and ways for limiting its spread in republic of Yemen. A session held in Aden, 5-7 December 1998. Aden: Aden-University Press; 1998.

12. Central Statistical Organization, Ministry of Plan and Cooperation, Republic of Yemen. Statistical Year Book. Sanaá: Central Statistical Organization; 2003.

13. Krebs NF, Himes JH, Jacobson D, Nicklas TA, Guilday P, Styne D, et al. Assessment of child and adolescent overweight and obesity. Pediatrics. 2007; 120: 193-228.

14. Centers for Disease Control and Prevention [Internet]. Rockville: Westate Inc; 2009. [updated 2009 Jan 23; cited 2009 Feb 24]. National Health and Examination Survey (NHANES). Anthropometry procedures manual. 2000. Available from: http://cdc.gov/nchs/nhanes.html

15. World Health Organization [Internet]. New York: WHO, Inc.; c2013 Growth reference data for 5-19 years. WHO 2007. [cited 2009 Feb 8]. Available from: http://www.who.int/

16. Timlin MT, Pereira MA, Story M, Neumark-Sztainer D. Breakfast eating and weight change in a 5-year prospective analysis of adolescents: Project EAT (Eating Among Teens). Pediatric. 2008;121:638-45.

17. Timperio A, Salmon J, Ball K, Baur LA, Telford A, Jackson M. Family physical activity and sedentary environments and weight change in children. Int J Pediatr Obes. 2008; 3: 160 7.

18. Musaiger AO. Overweight and obesity in the Eastern Mediterranean Region: can we control it? East Mediterr Health J. 2004; 10:789-93.

19. Langendijk G, Wellings S, Wyk M V, Thompson SJ, McComb J, Chusilp K. The prevalence of childhood obesity in primary school children in urban Khon Kaen, Northeast Thailand. Asia Pacific J Clin Nutr. 2003; 12 (1): 66-72.

20. Shah C, Diwan J, Rao P, Bhabhor M, Gokhle P, Mehta H. Assessment of obesity in school children. Calicut Med J. 2008; 6(3):1-8.

21. Branca F, Haik N, Lobstein T editors. The challenge of obesity in the WHO European Region and the strategies for response. World Health Organization; The Regional Office for Europe of the World Health; 2007 [cited 2010 Apr 2]. Available from: http://www.euro.who.int/pubrequest

22. Vernay M, Malon A, Oleko A, Salanave B, Roudier C, Szego E, et al. Association of socioeconomic status with overall overweight and central obesity in men and women: the French Nutrition and Health Survey 2006. BMC Public Health [Internet] 2009 July 2 [cited 2009 Nov 13]; 9: 215. [about 10 pages]. Available from: http://www.biomedcentral.com/14712458/9/215/

23. O'Dea JA. Gender, ethnicity, culture and social class influences on childhood obesity among Australian schoolchildren: implications for treatment, prevention and community education. Health Soc Care Community. 2008 May; 16(3): 282-90.

24. Vereecken CA, Inchley J, Subramanian SV, Lea Maes AH. The relative influence of individual and contextual socio-economic status on consumption of fruit and soft drinks among adolescents in Europe. Eur J Public Health. 2005; 15(3):224-32.

25. Skelton JA editor. Childhood obesity [internet]. Medical College of Wisconsin; Milwaukee, WI; 2004 [cited 2009 Jul 9]. Available from: http://www.josefe Childhood Obesity Monograph Part 1 Overview.html

26. Lauzon B, Aline M. Childhood obesity: influences of socioeconomic factor [internet]. Objective nutrition. 2004 Sep [cited 2013 feb 9]. 73: [about 1 p.]. Available from: http://www.danoneinstitute.org/objective_nutrition /on73.php

http://scielo.sld.cu