

Nutritional Status and Lipid Profile in School Children ages 6 to 11 in Aruba

s i m p l y 

Authors:

Dr. Richard Visser*, DC, PhD

Dr. Robert Wever **, Ph D

Dr. Gregory Laclé**, MD

Dr. Troadio Gonzalez***, Ph D

Dr. Angel Caballero***, Ph D

* Visser Wellness and Research Center

** General Hospital of Aruba

*** Institute of Nutrition and Food Hygiene

Key Terms: Obesity, Dyslipidemia, Childhood

Background of the Principal Author:

Director, Visser Wellness and Research Center

Havenstraat #30, Oranjestad ,ARUBA .

Tel (297) 583-0036 Fax.(297) 583-0031

E-mail: drvisser@simplyh.com

Abstract:

Obesity and dyslipidemias constitute an important health concern.

Objective: To determine the incidence of overweight and obesity and their relationship with concentrations of certain kinds of serum lipid components.

Materials and method: A nutritional study was conducted, utilizing anthropometric techniques, to examine the concentration of total serum cholesterol, HDL lipoproteins, LDL lipoproteins, and triglyceride levels in 325 students between the ages of six and eleven in Aruba.

Results: The study revealed that 122 students were overweight or obese, 20 were malnourished and 183 were within the healthy weight range. We found 83 stu-

health

holistic

humanidad

healing

humanity

honestidad

heart

home

dents with lipidogram readings outside the acceptable range. Conclusions: Obesity and dyslipidemias are health concerns that require urgent attention: over a third of the students are overweight and obese while nearly a quarter had pathological lipidogram readings that increased with the age of the child. The percentage of girls affected was higher than that of boys. Those children who were overweight or obese constituted a higher percentage of those affected than children in the healthy weight range.

Introduction

Concentrations of various serum lipid components and the nutritional state of children have been researched with increased frequency and in greater depth over the last few years, in response to results obtained to this point indicating a relationship between obesity and the presence of dyslipidemias in children^{1,2,3}.

Obesity and dyslipidemias are the result of multiple factors and causes that include genetic makeup, nutrition, physical activity and socio-cultural influences. Intervention is necessary in this area, with the goal of influencing these factors in order to lower their adverse affects on public health⁴.

The purpose of our work was to identify the incidence of overweight and obesity and their relationship with the concentration of certain blood lipid components found in elementary school students in Aruba.

Materials and Method:

We conducted a study of nutritional status, using anthropometric techniques, of the amount of total serum cholesterol, HDL lipoproteins, LDL lipoproteins, and triglyceride levels in 325 school children between the ages of six and eleven in Aruba in September, 2004.

For the study we used anthropometric techniques in compliance with Weiner and Lourie's International Biological Program⁵. The measurements were taken in schools by trained professionals utilizing a SECA brand mechanical scale with built-in height rod, fiberglass measuring tape and digital calibration.

The study measuring the concentration of blood lipids was based on blood samples drawn in the morning, after at least an eight-hour fasting period. The blood samples were drawn via venipuncture by highly qualified nurses using sterilized and disposable materials. The blood samples were processed and the corresponding determinations made at the laboratory in the General Clinical Hospital of Aruba.

The Watson⁶ and Carlson⁷ techniques were used for determining concentrations of total cholesterol, HDL lipoproteins, LDL lipoproteins and triglycerides.

s i m p l y 

health

holistic

humanidad

healing

humanity

honestidad

heart

home

Results:

Among the 325 elementary school students we found 122 children who were overweight or obese, 20 who were malnourished and 183 who were in the normal, healthy weight range.

We found 82 children with lipidogram readings outside the acceptable normal range, at least with respect to one of the blood lipid fractions studied.

Table 1 shows the distribution of children with pathological lipidograms, based on their anthropometric nutritional classification.

Of the children with pathological lipidograms, 51 were female while 31 were male.

Discussion

The high percentage of overweight or obese children (36.5%) found among the 325 school-aged students indicates the presence of a major public health concern in the childhood population sample researched: a problem which is supported by data already reported by other authors^{8,9,10,11}. To this known health problem we must now add the fact that 26.2% of school-aged children present a pathological lipidogram.

The large percentage of obese and overweight children among the 325 children studied is a finding similar to that of others who have researched this problem in populations that do not recognize obesity as an illness and a public health concern and which, as a result, instead of promoting the prevention and treatment of the problem, promote conditions and lifestyle that tend to favor it¹².

These results suggest the presence of potential dangers to the overall health of an important segment of the population studied. This is because it is largely accepted that such findings can be associated with coronary heart disease,³ diabetes mellitus^{13,14} and orthopedic problems¹⁵—among others—and may also be a contributing factor to the accelerated development of cardio-circulatory diseases whose anatomical-pathological basis is atheromatosis.

With regards to the appearance of abnormal values in serum lipid fractions, it has been hypothesized that elevated LDL lipoproteins are the most important disorder playing a role as an atherogenic factor: even more important than total cholesterol. In some case studies involving altered lipidograms, both disorders are found, while in other cases only the LDL lipoproteins are elevated, suggesting the potentially positive effect on health of HDL lipoproteins¹⁶.

The results of studies performed by other authors have indicated that total cholesterol and triglyceride levels in overweight and obese school-aged children are

s i m p l y 

health

holistic

humanidad

healing

humanity

honestidad

heart

home

higher than those in children of the same age who fall in the normal, healthy weight range^{3,12}. This matches the findings in our study, which determined that overweight and obese children had elevated LDL lipoprotein levels as well as elevated total cholesterol and triglyceride levels more often than their healthy-weight counterparts. This reaffirms that obesity is a factor that promotes the emergence of dyslipidemias.

Of the 82 school children with dyslipidemias, 41.4% were in the healthy weight range. This suggests that, in addition to the increased disease risk presented by obesity, other issues can exist, such as nutrition¹⁷ or genetic predisposition^{2,18}, which could also be possible contributory factors.

Obesity, as well as dyslipidemias, can generally be associated with systematic and regular consumption of an unbalanced diet. The simple act of consuming refined carbohydrates in excess can, by means of collateral paths in the intermediate metabolism, lead to an increase in the concentration of total serum cholesterol, LDL lipoproteins and triglyceride levels. Likewise, a similar result can be expected when one ingests excessive amounts of neutral saturated fats.

Some authors point out that cholesterol ingested as part of the diet does not contribute in a meaningful way to the development of atherogenesis^{19,20}. In addition, evidence exists which suggests that lipid peroxidation of unsaturated fatty acids and oxidized cholesterol, arising as the result of improper food processing, definitely constitute an important contributory factor in the development of cardiovascular disease.

The fact that the results of this study showed some malnourished and normal-weight children to have dyslipidemias, while some overweight and obese children did not, reaffirms the importance of genetic factors in the emergence and development of disease. This result does not, however, contradict the finding that obesity is a factor that facilitates the emergence and development of dyslipidemias.

In order to prevent and treat obesity and dyslipidemias, it is necessary for affected individuals to regulate their weight according to their age, gender and height. In order to achieve this goal, dietary habits must be modified without subjecting children to restrictive diets, giving first priority to a diet consisting of healthier foods, such as vegetable oils and fats, foods providing both insoluble and soluble dietary fiber, and a concomitant reduction of simple or refined sugars such as sucrose and lactose.

The increase in consumption of nutrients rich in vitamin B, C and E, beta-carotenes, trace elements such as zinc, copper, selenium and magnesium, which increase antioxidant levels in the diet and decrease the likelihood of development of oxidative stress, constitute a better use of carbohydrates and fatty acids and diminish the risk of developing obesity and dyslipidemias⁴.

s i m p l y 

health

holistic

humanidad

healing

humanity

honestidad

heart

home

Currently, great importance has been placed on the regular and systemic consumption of foods (primarily vegetables) that contain phytochemicals, due to their antioxidant effects and their contribution towards the preservation of the structural and functional quality of the biomembranes directly related with cellular energy metabolism—specifically with the development of the tricarboic acid cycle and of lipid beta oxidation at the mitochondrial level.

This undoubtedly constitutes a safety factor with regards to efficiently obtaining and utilizing free energy, as is required for the body to carry out its various biological functions, provided that a normal and balanced diet is present.

These guidelines are very useful when it comes to counseling the intake of foods of vegetable origin unaccompanied by other foods that provide excessive quantities of saturated fats or simple or refined sugars, given that such a combination could cause excess energy to be consumed, to the point of provoking a positive energy balance with respect to the individual's level of physical activity and thus bringing about a state of overweight or obesity, while at the same time promoting the development of in to the concentrations of various serum lipid fractions.

It has been pointed out that maintaining a lifestyle that facilitates the emergence of obesity and dyslipidemia rates similar to those found in the target population of this study will cause the problem to increase over time as a function of age⁵. This notion is supported by the data observed in the school children in this study, wherein the number of cases with elevated pathological lipid levels increased with age.

The lifestyle and nutritional habits acquired during childhood are those that will most likely be maintained during an individual's entire life. The difficulty of changing such habits after adolescence is common knowledge⁴.

These observations reaffirm the importance of directing efforts towards identifying these problems and their causes during childhood, in order to intervene most efficiently to prevent obesity and dyslipidemias.

Low levels of moderate to intense physical activity have been associated with the presence of pathological lipidograms in children^{1,9}, thus demonstrating the need for physical exercise to decrease risk. The results of this study, along with the high percentage of overweight and obese children identified, suggest the likelihood that these children suffer from an improper, sedentary lifestyle with its accompanying adverse biological effects, for which it becomes necessary to consider measures of intervention to counter the problems of obesity, overweight and dyslipidemias in general.

Conclusions:

Obesity and dyslipidemias are health problems that require urgent attention in

s i m p l y 

health

holistic

humanidad

healing

humanity

honestidad

heart

home

the population that was the subject of this research; over a third are overweight or obese and almost one in four had a pathological lipidogram. The frequency of these problems increased with the age of the school-aged children, and girls were more likely than boys to be affected. Those who were overweight or obese represented a greater number of those affected than those who were within the healthy weight range.

Bibliography:

1. Andersen LB, Wedderkop N, Hansen HS, Cooper AR, Froberg K. Biological cardiovascular risk factors cluster in Danish children and adolescents: the European Youth Herat Study. *Prev Med* 2003;37(4):363-7
2. Chen TJ, Ji CY, Pang ZC, Wang SJ, Hu YH, Qin Y. Heritability of serum lipids and lipoproteins and its related factors in twins aged 5 to 19 years of China. *Zhonghua Yu Fang Yi Xue Za Zhi*. 2004;38(4):237-9.
3. Li S, Liu X, Okada T, Iwata F, Hara M, Harada K. Serum lipid profile in obese children in China. *Pediatr Int*. 2004;46(4):425-8.
4. James PT. Obesity: the worldwide epidemic. *Clin Dermatol*. 2004;22(4):276-80.
5. Watson D. A simple method for the determination of serum cholesterol. *Clin Chim Acta* 1960;5:637-9
6. Carlson, LA. Determination of serum triglycerides. *J Atherosclerosis Res* 1963;3:333-5.
7. Weiner JS, Lourie JA. *Human Biology: A Guide To Field Methods International Biologic Programe*. Handbook no 9. Oxford Blackwell Scientific Publication LTD. 1969.
8. Whiteley P, Dodou K, Todd L, Shattock P. Body mass index of children from the United Kingdom diagnosed with pervasive developmental disorders. *Pediatr Int*. 2004;46(5):531-3.
9. Padez C, Fernandes T, Mourao I, Moreira P, Rosado V. Prevalence of overweight and obesity in 7-9 year old Portuguese children: Trends in body mass index from 1970-2002. *Am J Hum Biol*. 2004;16(6):670-8.
10. Manios Y, Yiannakouris N, Papoutsakis C, Moschonis G, Magkos F. Behavioral and physiological indices related to BMI in a cohort of primary schoolchildren in Greece. *Am J Hum Biol*. 2004;16(6):639-47.
11. Muzzo S, Burrows R, Cordero J, Ramirez I. Trends in nutritional status and stature among school-age children in Chile. *Nutrition*. 2004;20(10):867-72.

s i m p l y 

health

holistic

humanidad

healing

humanity

honestidad

heart

home

12. Demerath E, Muratova V, Spangler E, Li J, Minor VE, Neal WA. School-based obesity screening in rural Appalachia. *Prev Med* 2003;37(6):553-60

13. Gaylor AS, Condren ME. Type 2 diabetes mellitus in the pediatric population. *Pharmacotherapy*. 2004;24(7):871-8.

14. Wiegand S, Maikowski U, Blankenstein O, Biebermann H, Tarnow P, Gruters A. Type 2 diabetes and impaired glucose tolerance in European children and adolescents with obesity -- a problem that is no longer restricted to minority groups. *Eur J Endocrinol*. 2004;151(2):199-206.

15. Dowling AM, Steele JR, Baur LA. What are the effects of obesity in children on plantar pressure distributions? *Int J Obes Relat Metab Disord*. 2004;28(11):1514-9.

16. Garces C, Gil A, Benavente M, Viturro E, Cano B, de Oya M. Consistently high plasma high-density lipoprotein-cholesterol levels in children in Spain, a country with low cardiovascular mortality. *Metabolism*. 2004;53(8):1045-7.

17. Ballesteros MN, Cabrera RM, Saucedo Mdel S, Aggarwal D, Shachter NS, Fernandez ML. High intake of saturated fat and early occurrence of specific biomarkers may explain the prevalence of chronic disease in northern Mexico. *J Nutr*. 2005;135(1):70-3.

18. Bujo H, Takahashi K, Saito Y, Maruyama T, Yamashita S, Matsuzawa Y, Ishibashi S, Shionoiri F, Yamada N, Kita T; Clinical features of familial hypercholesterolemia in Japan in a database from 1996-1998 by the research committee of the ministry of health, labour and welfare of Japan. *J Atheroscler Thromb*. 2004;11(3):146-51.

19. Cheng HH, Wen YY, Chen C. Serum fatty acid composition in primary school children is association with serum cholesterol levels and dietary fat intake. *Eur J Clin Nutr*. 2003;57(12):1613-20

20. Ballesteros MN, Cabrera RM, Saucedo L, Fernández, ML Dietary cholesterol does not increase biomarkers for chronic disease in a pediatric population from northern Mexico. *Am J Clin Nutr* 2004;80(4):855-61

s i m p l y 

health

holistic

humanidad

healing

humanity

honestidad

heart

home

Table 1. Lipidograms of the school children studied

Classification	Normal	Pathological	Total
Malnourished	15	5 (25%)	20
Healthy weight range	149	34 (18.5%)	183
Overweight	23	9 (28.1%)	32
Obese	56	34 (37.7%)	90
Total	243 (74.7%)	82 (26.2%)	325

health

holistic

humanidad

healing

humanity

honestidad

heart

home