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LIPIDS PROFILE AMONG EGYPTIAN SCHOOL AGE OBESE CHILDREN

By

Mohammed Abd Al-Ghani Saad Kaka, Sabry Mohammed Ghanem, Sameh Abd Al-Aziz Ahmed and Tarek Abd Al-Kreem Al-Dahshan

Departments of Pediatrics and Clinical Pathology*, Faculty of Medicine, Al-Azhar University

Corresponding author: Mohammed Abd Al-Ghani Saad Kaka,

E-mail: mohammed_saad80@gmail.com

ABSTRACT

Background: Obesity and overweight raises adverse changes in lipid profiles as complications of obesity, while decreasing or increasing the related obesity indices such as BMI and waist circumference might affect the parameters of lipid.

Objectives: To assess lipid profile in school-age obese children.

Patients and methods: This case-control study was conducted on 80 Egyptian children divided into 4 equal groups according to anthropometric indexes: Overweight group, central obesity without general obesity group, central obesity with general obesity group and control group. All children were subjected to history taking, complete clinical examination, local systemic examination, complete blood count and fasting lipid profile.

Results: There was a statistically significant difference between the studied groups regarding skipping breakfast, access to soft drink at home, consumption of sweetened drink per week and frequency of fruit consumption. Higher percentage of control (Normal weight) group reported significantly less frequency of skipping breakfast (<3times/week), no access to soft drink at home, fewer consumption of sweetened drink per week (<3 times/week), and higher frequency of fruit consumption (≥3times/week). There was a statistically significant difference between the general central obesity and overweight groups regarding serum triglycerides, total cholesterol, LDL, VLDL and HDL cholesterol. There was a statistically significant difference between the general central obesity and control groups regarding serum triglycerides, total cholesterol, LDL, VLDL and HDL cholesterol. A statistically significant difference was between the central obesity and overweight groups regarding serum triglycerides, total cholesterol, LDL, VLDL and HDL cholesterol. Significant difference was found between the central obesity and control groups regarding serum triglycerides, total cholesterol, LDL, VLDL and HDL cholesterol.

Conclusion: Detection of abnormalities in lipid profile such as high TG and low HDL-C levels in overweight and obese children can help in preventing the child from progression to metabolic syndrome.

Keywords: Obesity, Lipid, Children.

INTRODUCTION

Obesity is the most common chronic metabolic diseases which influences the children and adolescents *(Hertelyova et al., 2015)*. Childhood obesity resulted in epidemic levels in developing and developed countries *(Sahoo et al., 2015)*.

Obesity affects 12% of children and levels of obesity in children aged two to 10 years rose from 9.9% to 13.4% between 2004 and 2011, according to the

Health Survey for England. Childhood obesity engages the risk factors for Cardiovascular Disease (CVD) including blood lipid abnormalities, hypertension, and atherosclerosis *(Kermanshahi et al., 2015).*

Cardiovascular disease results in high number of worldwide per year, so that these diseases have been accounted as the most important factor of death in developed countries. Obesity is one of the preventive factors in cardiovascular disease *(Kermanshahi et al., 2015).*

Indexes could be used to measure obesity are Body Mass Index (BMI), Waist Circumference (WC), and Waist to Hip Ratio (WHR). Obesity and overweight raises adverse changes in lipid profiles as complications of obesity, while decreasing or increasing the related obesity indices such as BMI and waist circumference might affect the parameters of lipid *(Fumani et al., 2010).*

This study was conducted to assess lipid profile in school-age obese children.

PATIENTS AND METHODS

This case-control study was conducted on 80 Egyptian children divided into 4 equal groups according to anthropometric indexes.

Group 1: Body mass index 85-95th percentiles to age and sex and waist circumference < 90th percentile to age and sex (overweight).

Group 2: Body mass index < 85th percentiles to age and sex and waist circumference equal or more than percentile 90 to age and sex (central obesity without general obesity).

Group 3: Body mass index ≥ 95th percentile to age and sex and waist circumference equal or more than percentile 90 to age and sex (central obesity with general obesity).

Group 4 (control group): Body mass index < 85th percentiles to age and sex and waist circumference < 90th percentile to age and sex, were matched of age, gender and residence with case groups by using group-matching method.

The children were presented to the Al-Hussein University Hospital and to Edico Ministry of Health General Hospital.

Inclusion criteria:

- Obesity.
- Both sexes.
- Aged 6-18 years.
- Apparent healthy, mentally and psychologically stable, cooperative and motivated.

Exclusion criteria:

- Diabetic child.
- Heart disease.
- Congenital anomalies.
- Endocrine diseases.

Methods:

History taking:

- Diet.
- Age of onset and time of most increase.
- Presence of any other endocrine disease.
- Family history of obesity, diabetes, and endocrine diseases.
- Physical and psychological complications.

Complete clinical examination:

- General examination including vital signs (BP, RR, HR and body tempreature) and general appearance.
- Complete physical examination including height, weight, Body Mass Index (BMI), and waist circumference.

Local systemic examination:

- CNS examination including speech, sensory and motor.
- CVS examination including HS and murmers.
- Respiratory examination including breathing type and sounds.
- Abdomen examination including liver and spleen.
- Skeletal examination including UL, LL, fingers and feat.

Laboratory investigations:

- Complete blood count.
- Fasting lipid profile in blood in the case group and the control group after 12 hours fasting, included serum Total Cholesterol (TC), serum Triglycerides (TG), serum High-Density Lipoprotein (HDL) and LDL cholesterol level (LDL).

Statistical analysis:

Recorded data were analyzed using the statistical package for the social sciences, version 20.0 (SPSS Inc., Chicago, Illinois, USA). Quantitative data were expressed as mean± standard deviation (SD). Independent samples t-test of significance was used when comparing between test means. P-value <0.05 was considered significant.

RESULTS

There was a statistically non-significant difference between the studied groups regarding age or gender **(Table 1)**.

Table (1): Comparison between the studied groups regarding demographic characteristics

Groups / Demographic characteristics	General and central obesity group	Central without general obesity group	Overweight group	Control (Normal weight) group	P Value
	N=20 (%)	N=20 (%)	N=20 (%)	N=20 (%)	
Gender:					
Males	9 (45)	13 (65)	13 (65)	12 (60)	**0.528**
Females	11 (55)	7 (35)	7 (35)	8 (40)	
Age (years):					
Mean ± SD	11.6 ± 2.41	12.5 ± 2.89	12.5 ± 2.67	10.95 ± 3.07	0.211
Range	6 - 15	6 - 17	6 - 16	6 - 17	

F One way ANOVA

There was a statistically significant difference between the studied groups regarding skipping breakfast, access to soft drink at home, consumption of sweetened drink per week and frequency of fruit consumption. Higher percentage of Control (Norma weight) group reported significantly less frequency of skipping breakfast (<3times/week), no access to soft drink at home, fewer consumption of sweetened drink per week (<3 times/week) and higher frequency of fruit consumption (≥3times/week). There was a statistically non-significant between the studied groups regarding frequency of vegetable consumption/week **(Table 2)**.

Table (2): Comparison between thee studied groups regarding dietary habits

Groups / Dietary habits	General and central obesity group N=20 (%)	Central without general obesity group N=20 (%)	Overweight group N=20 (%)	Control (Normal weight) group N=20 (%)	P Value
Skip breakfast:					
<3 times/week	9 (45)	7 (35)	9 (45)	16 (80)	0.025
≥ 3 times/week	11 (55)	13 (65)	11 (55)	4 (20)	
Access of Soft drink at home:					
No	7 (35)	6 (30)	13 (65)	15 (75)	0.008
Yes	13 (65)	14 (70)	7 (35)	5 (25)	
Sweetened drink:					
<3 times/week	6 (30)	9 (45)	10 (50)	15 (75)	0.038
≥3times/week	14 (70)	11 (55)	10 (50)	5 (25)	
Fruit consumption					
≥3times/week	9 (45)	8 (40)	11 (55)	17 (85)	0.021
<3 times/week	11 (55)	12 (60)	9 (45)	3 (15)	
Vegetables consumption:					
≥3times/week	15 (75)	13 (65)	13 (65)	15 (75)	0.813
<3 times/week	5 (25)	7 (35)	7 (35)	5 (25)	

There was a statistically significant difference between the general central obesity and overweight groups regarding serum triglycerides, total cholesterol, LDL, VLDL and HDL cholesterol. There was a statistically significant difference between the general central obesity and control groups regarding serum triglycerides, total cholesterol, LDL, VLDL and HDL cholesterol. There was a statistically significant difference between the central obesity and overweight groups regarding serum triglycerides, total cholesterol, LDL, VLDL and HDL cholesterol. There was a statistically significant difference between the central obesity and control groups regarding serum triglycerides, total cholesterol, LDL, VLDL and HDL cholesterol. There was a statistically significant difference between the general central obesity and overweight groups regarding serum TG, TC, LDL, VLDL and HDL cholesterol **(Table 3)**.

Table (3): Comparison between the studied groups (general with central obesity and overweight groups) regarding lipid profile

Obese / Parameters	General and central obesity group (a) N=20 (%)	Overweight group (b) N=20 (%)	Control Group (C) N=20 (%)	P Value
Triglycerides(mg/dL): Mean ± SD Range	144.25 ± 29.84 100 – 210	116.25 ± 32.23 85 – 195	99.3 ± 31.92 70 – 190	0.007
T. cholesterol(mg/dL): Mean ± SD Range	198.5 ± 29.07 150 – 260	159 ± 23.82 120 – 200	148.35 ± 15.02 120 - 180	<0.001
LDL cholesterol: Mean ± SD Range	139.75 ± 25.88 156 – 390	104.75±21.06 70 - 145	91.75 ± 12.06 65 - 115	<0.001
HDL cholesterol: Mean ± SD Range	44.2 ± 8.15 35 – 60	49.25±6.93 40 - 60	49.15 ± 4.94 40 - 60	0.042
VLDL cholesterol: Mean ± SD Range	28.85 ± 5.97 20 – 42	23.25 ± 6.45 17 - 39	19.86 ± 6.38 14 - 38	0.007

t independent sample t test

Skipping breakfast, access to soft drinks at home and eating while watching TV significantly increased risk of dyslipidemia **(Table 4)**.

Table (4): Binary logistic regression of factors associated with hyperlipidemia

Regression / Factors	β	Adjusted Odds Ratio	95% C.I.		P-Value
			Lower	Upper	
Skip breakfast(≥3 times/week)	1.610	5.001	1.599	15.645	0.006
Access to soft drink at home	1.610	5.001	1.599	15.645	0.006
Eating while watching TV	1.709	5.523	1.763	17.299	0.003

Access to soft drinks at home, eating while watching TV, and fruit consumption (<3 times/week) significantly increased risk of obesity by 4.67, 3.057 and 4.15 folds respectively. Watching TV in the morning non-significantly increased risk of obesity by 2.721 folds **(Table 5)**.

Table (5): Binary logistic regression of factors associated with obesity

Regression / Factors	β	Adjusted Odds Ratio	95% C.I.		P-Value
			Lower	Upper	
Access to soft drink at home	1.541	4.670	1.582	13.783	0.005
Eating while watching TV	1.118	3.057	1.050	8.904	0.04
Fruit consumption (<3 times/week)	1.423	4.150	1.362	12.646	0.012
Watching TV in the morning	1.001	2.721	.922	8.031	0.07

CI Confidence interval

DISCUSSION

Our work was on 80 Egyptian children at age of 6-18 years. As regards age, our study revealed a statistically non-significant difference between the studied groups regarding age. *Giles et al. (2013)* reported a critical periods of obesity development which have been well recognized for many behavioral and developmental processes. Such periods have not been widely reported for nutritional diseases. Two and possibly three critical periods exist for the development of obesity and its complications. These include gestation and early infancy, the period of adiposity rebound that occurs between 5 and 7 y of age, and adolescence. Obesity that develops in or persists into adolescence is not only the most difficult to treat, but also associated with the greatest risk of serious complications.

As regards gender, our study showed no significant difference between the studied groups. This agrees with *Cynthia et al. (2012)* who showed the same results in their study. *Minakshi and Chithambaram (2016)* identified the abnormalities of lipid profile early 71% were overweight and 29 % were obese. Males were 64 % and females were 36 %.

Wisniewski and Chernausek (2011) revealed that gender differences were common, both before and during puberty. Boys are more prevalent for development of obesity more than girls because of difference in body composition, patterns of weight gain, hormone biology, and the susceptibility to certain social, ethnic, genetic, and environmental factors.

In our study, there was a statistically significant difference between the studied groups regarding skipping breakfast, access to soft drink at home, consumption of sweetened drink per week and frequency of fruit consumption. Higher percentage of control (Normal weight) group reported significantly less frequency of skipping breakfast (<3times/week), no access to soft drink at home, fewer consumption of sweetened drink per week (<3 times/week) and higher frequency of fruit consumption (≥3times/week).

There were statistically significant differences between the general central obesity and overweight groups, between the general central obesity and control groups, between the central obesity and overweight groups and between the central obesity and control groups regarding serum triglycerides, total cholesterol, LDL, VLDL and HDL cholesterol. Also, there were statistically significant difference between the central obesity and general with central obesity groups regarding serum triglycerides, total cholesterol, LDL, VLDL and HDL cholesterol.

Regarding dyslipidemia, there was a statistically significant difference between the studied groups regarding presence of dyslipidemia. There were statistically significant relations between dyslipidemia and frequency of skipping breakfast, access to soft drink at home, frequency of use of sweetened drinks, frequency of any sports activity and eating while watching TV. There were statistically non-significant relations between dyslipidemia and age, gender, frequency of fruit, vegetable consumption, frequency of transport to school, chores at home and watching TV in the morning.

Hendrix et al. (2014) have proposed that time spent viewing TV may lead to obesity by one or a combination of decreased physical activity, increased energy intake, increased sedentary behavior, exposure to food advertising and reduced sleep time.

Zimmerman and Bell (2010) found that TV viewing was more strongly associated with weight gain when the content included commercials than when viewing was limited to non-commercial programs. More TV watching is often accompanied by reduced amounts of exercise and increased sedentary behavior. When watching TV, the children often consume more carbonated drinks and dessert, which are important causes of obesity.

Zhang et al. (2015) suggested that increased TV watching is associated with an increased risk of childhood obesity. A statistically linear relationship between TV watching and childhood obesity risk is also found. The association is observed in both boys and girls.

On doing binary logistic regression analysis of factors associated with hyperlipidemia, skipping breakfast, access to soft drinks at home and eating while watching TV significantly increased risk of dyslipidemia by 5.001, 5.001 and 5.523 folds respectively. On doing binary logistic regression analysis of factors associated with obesity, access to soft drinks at home, eating while watching TV, and fruit consumption (<3 times/week) significantly increased risk of obesity by 4.67, 3.057 and 4.15 folds respectively. Watching TV in the morning non-significantly increased risk of obesity by 2.721 folds. *Kelishadi et al. (2012)* assessed the effects of an educational lifestyle course on lipid profile and weight of obese children. Regression analysis showed a significant relationship between mean BMI and HDL, TG and TC.

Treatment depends on the type of dyslipidemia. The lipid profile is completely diverse, while in familial dyslipidemia, there is significant hypercholesterolemia with LDL-c levels possibly over 400 mg/dl in dyslipidemia associated with metabolic syndrome, there is a higher trend of hypertriglyceridemia, low HDL-c levels, and LDL-c levels without quantitative but rather qualitative changes, such as small dense particles which are more *atherogenic (2010)*.

Kelishadi et al. (2012) showed that modern lifestyle and new nutritional patterns put children and adolescents at risk of CVD in many countries. Appropriate treatment methods should be planned specifically for each age group. In addition, regular educational sessions are necessary to make changes in behavior and attitude of children and families toward obesity.

Minakshi and Chithambaram (2016) identified abnormal lipid profile in overweight and obese children early and initiate non-pharmacological management, behavioral therapy and if required pharmacological therapy thereby preventing these children from developing metabolic syndrome and its associated long-term complications.

CONCLUSION

Detection of abnormalities in lipid profile such as high TG and low HDL-C levels in overweight and obese children can help in preventing the child from progression to metabolic syndrome.

Moreover, we should initiate appropriate non pharmacologic or pharmacologic treatment early to prevent the complications of abnormal lipids.

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نمط الدهون بين اطفال المدارس المصرية المصابين بالسمنة

محمد عبد الغنى سعد قاقا, صبرى محمد غانم, سامح عبد العزيز احمد, طارق عبد الكريم الدهشان

قسم طب الاطفال، كلية الطب، جامعة الازهر

قسم الباثولوجيا الاكلينكية*، كلية الطب، جامعة الازهر

E-mail: mohammed_saad80@gmail.com

خلفيـــة البحـــث: تثيـــر البدانـــة وزيـــادة الـــوزن التغيـــرات الســـلبية فـــي نمـــط الـــدهون كمضـــاعفات الســـمنة، فـــي حـــين أن خفـــض أو زيـــادة مؤشـــرات الســـمنة ذات الصـــلة مثـــل مؤشر كتلة الجسم ومحيط الخصر قد تؤثر على معطيات الدهون.

الهـدف مـن البحـث: تقيـيم نمـط الـدهون فـي الأطفـال الـذين يعـانون مـن السـمنة فـي سـن المدرسة.

المرضـــى وطـــرق البحـــث: أجريـــت دراســـة مراقبـــة الحالـــة هـــذه علـــى 80 طفـــلا مصـــريا مقســـمة إلـــى 4 مجموعـــات متســـاوية وفقـــا لمؤشـــرات قيـــاس الأنثروبومتريـــات. مجموعـــة زيـــادة الـــوزن، والســـمنة المركزيـــة دون مجمـــوع الســـمنة العامـــة، والبدانـــة المركزيـــة مـــع مجمـــوع الســـمنة العامـــة ومجموعـــه القيـــاس. وتعـــرض جميـــع الأطفـــال لأخـــذ التـــاريخ المرضـــي والفحـــص الســـريري الكامـــل، والفحـــص الجهـــازي ، وعـــدد الـــدم الكامـــل ونســـبه الـــدهون فـــي مجموعـــة الـــتحكم ومجموعـــات الفحـــص بعـــد صـــيام 12 ساعه.

نتـــائج البحـــث: هنـــاك فـــرق إحصـــائياً هامـــاً بـــين المجموعـــات المدروســـة فيمـــا يتعلـــق بتخطـــي وجبـــة الإفطـــار، واســـتهلاك المشـــروبات الغازيـــة فـــي المنـــزل، واســـتهلاك المشـــروبات المحـــلاة فـــي الأســـبوع، وتـــواتر اســـتهلاك الفاكهـــة.وبلغت نســـبة أعلـــى مـــن مجموعـــة الـــتحكم (وزن طبيعـــي) عـــن تـــردد أقـــل بكثيـــر فـــي تخطـــي وجبـــة الإفطـــار (<3 مرات/أســـبوعيا)، وعـــدم الوصـــول إلـــى المشـــروبات الغازيـــة فـــي المنـــزل، واســـتهلاك أقـــل مـــن المشـــروبات المحـــلاة فـــي الأســـبوع (<3 مرات/أســـبوعيا) وتـــواتر أعلـــى لاســـتهلاك الفاكهـــة (≤3 مرات/أســـبوعيا). وهنـــاك فـــرق إحصـــائياً بـــين الفئـــات العامـــة

للسمنة المركزية وزيادة الوزن فيما يتعلق الدهون الثلاثية، والكوليستول الكلي والبروتين الدهني عالي الكثافه والبروتين الدهني منخفض الكثافة، كذلك هناك فرق إحصائي بين السمنة المركزية العامة ومجموعات السيطرة فيما يتعلق الدهون الثلاثية, الكوليسترول الكلي, كما أن هناك فرق إحصائي بين الفئات المركزية السمنة ومجموعه زيادة الوزن فيما يتعلق بالدهون الثلاثيه، والكوليسترول الكلي، والكوليسترول قليل الكثافة، وقليل الكثافة جدا. وهناك فرق إحصائي بين مجموعات السمنة المركزية ومجموعه القياس على الدهون الثلاثية، والكوليسترول الكلي، والكوليسترول قليل الكثافة، وقليل الكثافة جدا والكوليسترول عالى الكثافة.

الإستنتاج: يمكن أن يساعد إكتشاف النسب الغير طبيعية في ملامح الدهون مثل TG عالية ومستويات HDL-C منخفضة في الأطفال الذين يعانون من زيادة الوزن والسمنة في منع الطفل من أن يحدث له متلازمة التمثيل الغذائي.

الكلمات الدالة: نمط الدهون، السمنة، اطفال المدارس المصرية.