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Research Article

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Effect of Obesity on Serum Lipid Profiles in Libyan Children

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ABSTRACT

Overweight and obesity are important determinants of health leading to adverse metabolic change and increase the risk of non-communicable diseases affecting both developed and developing world. This study was aimed to examine the relationship between obesity and lipid profiles among Libyan children and to compare them with those with normal body weight.

The study was conducted on (245) Libyan children. 93 males, 152 females were recruited with age ranging from (3-19 years). Among the tested sample, it has been found that 107 cases were obese (BMI > 30), 47 cases were normal (BMI < 25), and the rest were classified as overweight which was excluded from this study.

Data were collected from the pediatric nutrition clinic (PNC), of the out-patient department (OPD), Tripoli Pediatric Central Hospital in Libya. These children were referred to the nutrition clinic by the pediatrician for nutritional assessment and to be followed up by the dieticians for further nutritional treatment.

Their main problems were obesity, diabetes, underweight, anemia, and others. The time period of data collection was about 12 months commencing July 2014. In this work a retrospective study was conducted to examine the effect of obesity on lipid profiles among Libyan children.

Body mass index (BMI) was calculated using the formula: weight (kg)/height (m^2).

Blood samples were collected for analysis of total cholesterol (TC), triglycerides (TG), high density lipoprotein (HDL), and low density lipoprotein (LDL). Lipid profile values in obese subjects (BMI >30) were compared with those with normal body weight (BMI<25).

The obese group had higher total cholesterol Tc, triglycerides TG, and low density lipoproteins LDL with the significant differences ($P < 0.05$) when compared to normal body weight group, where's high density lipoproteins HDL-c was significantly lower in obese subjects.

Our study demonstrate an association between the lipid profile and body adiposity in obese children and adolescents, thus reinforcing the importance of treating obese adolescents early to prevent health related problems in adult life.

Keywords- *Obesity; Lipid profile; Body mass index (BMI).*

INTRODUCTION

Thirty years ago, fundamental changes in social and economic situation occurred all over the world, thus leading to the presence of modern conveniences in homes as well as in the work place. These changes has shifted societies from communicable to non-communicable diseases (NCD).[1-3]

During the past three decades, there has been a considerable increase in prevalence of obesity in both developed and developing countries.[4-6] Overweight and obesity are serious health problems, since they are associated

with other diseases, and they contribute to ill health.[7] Obesity is strongly associated with disorders such as hypertension, coronary heart disease, hyperlipidemias, type 2 diabetes, liver disease, gall bladder disease, osteoarthritis, obstructive sleep apnea, metabolic syndrome,hyperuricemia, and certain types of cancer.[8-15]

Studies indicate that the prevalence of obesity increases the risk for developing cardiovascular diseases and diabetes.[16-19] Its role as a health hazard in adults has been well recognized for some time[20-26], but little attention has been paid to childhood and adolescent obesity.[27-30]

Obesity is associated with a high rate of morbidity and early mortality if left untreated.[31,32] Obese individuals have an increased overall morbidity and mortality rates compared to the normal weight population.[32] The world health organization (WHO) describes overweight and obesity as one of today's most important public health problems, which is escalating as a global epidemic.[34]

It's also increasingly recognized as a significant problem in developing countries and countries undergoing economic transition.[35] The prevalence of obesity is > 30% in some pediatric populations.[36-37]Obesity in childhood is associated with obesity in adulthood, particularly mortality from cardiovascular diseases, which are independent of adult weight.[38,39] Cardiovascular diseases remain the leading cause of premature mortality, morbidity, and high healthcare costs.[40] The majority of cardiovascular diseases is caused by risk factors that can be controlled, treated or modified such as high blood pressure, cholesterol, overweight and obesity, tobacco use, lack of physical activity and diabetes.[41]

Death from non-communicable chronic diseases is higher than those for all communicable diseases.[42-43] Until recently the relation between obesity and coronary heart

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diseases was viewed as indirect through hypertension, dyslipidemia, and impaired glucose tolerance. However, long-term longitudinal studies indicate that obesity as such not only relates to but independently predicts coronary atherosclerosis.[44-45]

Epidemiologic evidence supports the theory that the relation between obesity and disease risk begins early in life. For instance, adolescents who died in accidents had fatty streaks in the coronary arteries and aorta that were found at, autopsy, and were associated with blood lipid profile, blood pressure, and obesity status obtained at one or more points antemortem.[46,47] Moreover, a recent longitudinal study indicated that the occurrence of overweight, hypertension, and dyslipidemia in young adults (aged 19 to 32 years) was associated with these same risk factors in childhood.

The study was aimed to establish the correlation between lipid profile and obesity in Libyan children, and then compare them with values obtained from normal body weight group.

MATERIALS AND METHODS

From outpatients clinic (Tripoli Pediatric Central Hospital) in Libya, 245 (93 males and 152 females) subjects were recruited with age ranging from (3 to 19 years). Subjects with history of diabetes, hypertension, cardiovascular, renal, liver, or thyroid diseases were excluded. The data were collected in a time period of about 12 months commencing July 2014. All children selected for this study had Libyan nationality, the questionnaire was a face-to-face interview to assess the children's lifestyle and health status. Questions included the number of main meals consumed per day representing in three meals per day breakfast, lunch, and supper. Eating while watching TV was also included and answered as "eating", "not eating", and "sometime while watching TV.

Researchers took anthropometric measurements, such as weight in kilograms (kg) and height in centimeters (cm), weight and height were taken using standard procedure. All measurements were performed by trained nutritionists or physical education teachers.

The anthropometric measurements were conducted according to the Anthropometry Procedures Manual proposed by the National Health and Nutrition Examination Survey 2002.[48]

For measuring weight, each examiner was supplied with weighing scale with height bars attached to it on which weight was measured in kilograms using a standardized procedure (lightly dressed, without shoes). Subjects stood in the center of the scale platform facing the recorder, hands at side, looking straight ahead. The recorder took the measurements to the nearest 0.1 kilograms. Height was measured by stadiometer in centimeters with subjects asked to stand up straight without shoes and with head pointing straight forward. Subjects were asked to remove any accessories such as jewelry and "hejab" (covering) from the top of the head in order to properly measure stature. Subjects were asked to stand on the floor with the heels of both feet together and the toes pointed slightly outward at approximately a 60°angle. After making sure that the body weight was evenly distributed with both feet flat on the floor, proper heel position, and the buttocks, shoulder blades, and back of the head in contact with the vertical backboard, the recorder, at eye level of the headboard, took the height to the nearest 0.1 centimeter and these values was converted to meters.

Body Mass Index (BMI) variable was calculated using the following formula:

BMI = Weight (kg)/ Height (m^2), The BMI values were calculated for each gender and age.

Blood samples were withdrawn for analysis of total cholesterol (TC), triglycerides (TG), high-density lipoprotein (HDL) and low-density lipoprotein (LDL). For the purpose of comparing the lipid profiles of obese and normal cases, the National Cholesterol Education Program (NCEP) which was created in 1985 by the National Heart, Lung, and Blood Institute (NHLBI) to educate both the public and medical professionals about the benefits of lowering cholesterol levels so as to reduce the risk for coronary heart disease has been used as a reference method for lipid assessments of children (Table 1).

Data was computerized and analyzed using SPSS statistical package which has been utilized to calculate the statistical parameters such as mean and standard deviation. Subjects with BMI < 25 were considered normal, and BMI > 30 were considered obese, according to World Health Organization (global database on body mass index BMI). Results were presented as means ±SD. Lipid profile values in obese subjects (BMI > 30) were compared with those with normal body weight (BMI < 25). For the significance of the difference in the mean values, student t-test was applied, $P < 0.05$ was considered statistically significant.

RESULTS

Lipid profile tests were carried out on sample size which consisted of 245 different cases such as obese, overweight, and normal Libyan children aged from 3 to 19 years. Among the above mentioned sample, 107 cases were classified as obese (BMI >30), 49 males (45.8%) and 58 females (54.2%), and 47 subjects as normal (BMI<25), 15 males (31.9%) and 32 females (68.1%). In addition, it has been observed that there was no significant statistical difference between obese and normal weight groups in sex distribution and mean age (Table 2).

Statistical data has been presented mean, and standard deviation for males and females in each lipid profile test for both obese and normal subjects, it has been found that the mean values were not different statistically (Tables 3, and 4).

Table 5 shows that the obese group had higher triglycerides TG, total cholesterol TC, and low density lipoproteins LDL with the significant difference (P <0.05) when compared to normal body weight group. High density lipoproteins HDL-c was significantly lower in obese subjects. Statistical significant value ($P < 0.05$) was proved by the student t test for the obese and normal cases.

Table 1: National cholesterol education program (NCEP) lipid assessments for children

Children (< 20 y)	Desirable level (mg/dL)	Borderline level (mg/dL)	Undesirable level (mg/dL)
TC	< 170	170-199	≥200
LDL-C	< 110	110-129	≥130
HDL-C*	>45	35-45	< 35
TG☻	< 125	...	≥125

* This was not established by NCEP; these values were the adult cut points used at the time that the pediatric NCEP guidelines were established.

Table 2: Sample size and mean age group

	Obese BMI > 30	Normal BMI < 25
Studied cases	107	47
Male	49 (45.8%)	15 (31.9%)
Female	58 (54.2%)	32 (68.1%)
Age mean ± SD	10.38 ± 2.646	8.43 ± 2.733

☻ This was not established by NCEP; a TG level of 125 mg/dL approximates the mean 95th percentile for TGs in boys and girls during childhood and adolescence.

Table 3: Mean and SD for obese (BMI >30)

Lipid profile	Sex	N	Mean	±SD
Total cholesterol	Female	32	167.2500	14.48024
	Male	15	162.6667	1.58865
Low density lipoproteins	Female	32	120.2813	17.43418
	Male	15	115.3333	17.02799
Triglycerides	Female	32	111.5000	6.14870
	Male	15	112.8000	6.47192
High density lipoproteins	Female	32	39.9688	13.41276
	Male	15	52.8000	10.28313

Table 4: Mean and SD for normal (BMI<25)

Lipid profile	Sex	N	Mean	±SD
Total cholesterol	Female	58	204.5000	6.26673
	Male	49	201.7755	7.81096
Low density lipoproteins	Female	58	134.7931	5.97879
	Male	49	127.3673	15.80703
Triglycerides	Female	58	126.3448	5.18280
	Male	49	127.3469	1.66522
High density lipoproteins	Female	58	32.4828	2.55632
	Male	49	32.6531	1.65266

Table 5: A comparison between obese and normal body weight lipid profile

DISCUSSION

This study has shown higher figures which is suggestive of obesity epidemic in 21 century, and is not limited to Libyan children, but it's a global problem. The findings of the present study showed significantly positive correlation between obesity and lipid profile. Among many factors such as consumption of high fatty foods , sedentary life styles (such as spending long time watching TV), and physical inactivity. All above mentioned factors and others had significant contribution to increase serum lipid profile in the body because of obesity and overweight.

From table 2 there was no significant statistical difference between obese and normal weight groups in sex distribution and mean age. Regarding the other possible factors which may contribute to raise lipid abnormalities (diabetes, hypertension, renal, liver, and thyroid disorders), smokers, alcoholics, and taking drugs like diuretics, steroids, and lipid lowering drugs were excluded from the study.

This study has indicated that there were higher total cholesterol TC, triglycerides TG, and low density lipoproteins LDL-c among the obese group (statistically significant $P < 0.05$). However, HDL-c was lower for the same group (statistically significant, as well $P < 0.05$), which is consistent with the results of previous study.[49] The increased levels of total cholesterol, triglycerides, LDL, and low levels of HDL associated with obesity showing the higher risk of cardiovascular diseases in obesity. With several complications associated obesity, in particular the lipid abnormalities which are a leading cause of morbidity, and mortality, it is of importance, that the prevalence of obesity should be reduced among Libyan children. Early detection and prevention of obesity and abnormal lipid profile can help to reduce morbidity, and mortality through improving public awareness about healthy lifestyle and food habits.

RECOMMENDATIONS

- There is an urgent need to spread awareness about obesity, its consequences,ways, and means of prevention especially among young females.

- Nutrition and physical education programs in the schools are recommended to promote healthy life styles and dietary habits.

- The best nutrition advice to keep children healthy includes:

a. Eat a variety of foods.

b. Balance the food you eat with physical activity.

c. Encourage children to adopt a lifestyle involving aerobic form of exercise.

d. Choose a diet with plenty of grain products, vegetables and fruits.

e. Choose a diet low in fat, saturated fat, and cholesterol.

f. Choose a diet moderate in sugars and salt.

g. Choose a diet that provides enough calcium and iron to meet their growing body's requirements.

h. Increase the consumption of whole grain foods and cereal products rather than the refined varieties.

- Family-based interventions should be encouraged to maintain long-term weight loss.

- Further comprehensive research is required to study the life style of the families of obese children and how to prevent obesity.

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