

A Dyslipidemia Survey on Iraqi Pediatrics and Teenagers

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Abstract

Dyslipidemia is a pathological condition in which lipids profile and blood proteins are in abnormal proportions and is associated with many diseases and has major complications such as cardiovascular diseases that are linked to high HDL and risk factors increase, especially in young people, and there may be a link between chronic diseases and high fat percentage, 1482 blood samples were collected for children aged between (2-17) years for both sexes and separated by centrifuge device to measure the percentage of total body fat. The measurements for the fat of Iraqi male children showed (>25%) of elevated TC, and (>27%) in female population, also over 45% of the male and 30% of female population have had an elevated TG, While all male population had a low HDL only (61%) of the female population were in the high risk category. All these percentage indicates a high lipid profile among pediatrics which in turn makes huge health problems in the general health of future young especially cardiovascular diseases. Finally a routine lipid profile work should be done since the age of 9 or less according to the individual health and nutrition and that is what the National Cholesterol Education Program has recommended.

Key words: Dyslipidemia, lipid profile, Pediatrics, Non-HDL-C

INTRODUCTION

Dyslipidemia is a condition in which the blood lipid to protein ratio is aberrant, and it has been scientifically proved that it can be determined by hereditary and environmental variables (Talmud pj, Waterworth DM 2000).

Having dyslipidemia puts a person at risk for a wide range of diseases and health problems, including heart disease, stroke, diabetes, and high blood pressure (pediatr Gastroenterol Hepatol Nutr 2014 June 17). High cholesterol and high-density lipoprotein (HDL) are both linked to cardiovascular disease (McGill HC Jr, *et al.* 2000). Asymptomatic cardiovascular disease has a greater number of risk factors as the disease spreads (Berenson G, *et al.*, 1998).

Experts in Brazil have issued a warning to parents about their children and adolescents' risk of hyperlipidemia. There's no way to tell how common this ailment is without more information (Rev Bras Epidemiol 2012). For this reason, numerous studies have shown that atherosclerosis develops in childhood and that high cholesterol levels in the blood are connected with chronic non-communicable diseases (Berenson G, *et al.*; 1998) and imply that dyslipidemia is one of these conditions. Diseases of the circulatory system are linked to infectious diseases. Research has showed that hyperlipidemia in children and adolescents has grown in various parts of Brazil (Rev Bras Epidemiol 2012) .

METHOD

Serum was separated by centrifugation for 1482 sample of children for both sex (male and female) between 2-17 years in Central Children's Teaching Hospital, Yarmouk Teaching Hospital, Kadhimiya Children's Hospital, Al-Imameen Al-Kadhimiyan City Hospital, Al Alawia children Hospital and use Automated Analyzer to measure total cholesterol (Tchol), Triglycerides (TG), High density lipoprotein (HDL) and Low density Lipoprotein (LDL).

RESULTS

Serum lipid determination

A total of 1482 subjects were analyzed, with an age range between (2- 17). The differences in mean blood lipid parameters between the study groups standard normal range are shown in table (1) were significant higher of total cholesterol, TG and LDL in children group compared to the normal range. While was significant lower of HDL in children group. Also the study showed no significant difference between male and female in lipid serum levels in patient as shown in figure (2)

Table 1: The difference in mean blood lipid parameters between the 2 study groups.

	Patients	S. error	Normal	S. error	Z-test
CHO	4.680861	0.060254	3.623839	0.152703	0.01*
TRI	1.7901	0.046144	1.625455	0.032538	0.01*
HDL	1.112758	0.012356	2.417273	0.234808	0.01*
LDL	3.070103	0.039293	2.35	0.277746	0.01*

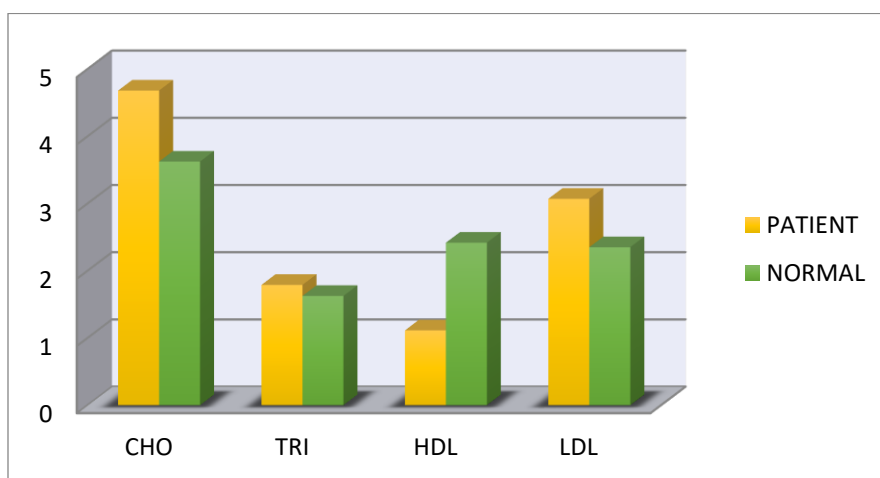


Figure 1: The difference in mean blood lipid parameters between patients compared to normal range.

Table (2): The difference in mean blood lipid parameters between the female and male.

	female	male	z-test
cholesterol	4.673606	4.788029	0.01
tri	1.428145	1.621677	0.01
HDL	1.213007	1.142885	0.01
LDL	2.898301	3.013204	0.01

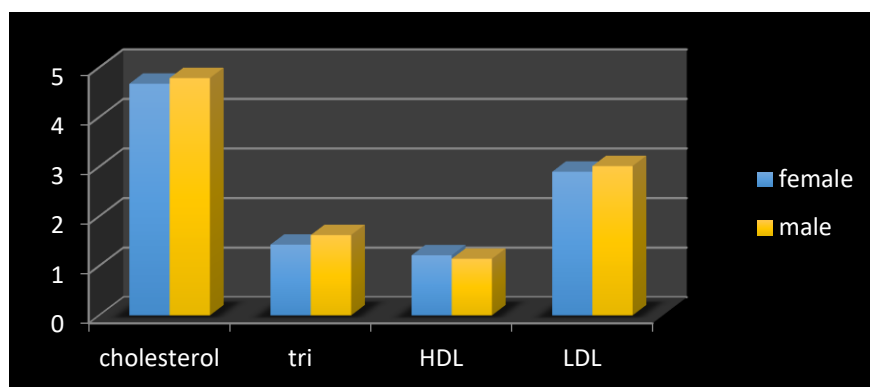


Figure (2): The difference in mean blood lipid parameters between the female and male in children

The total sample size of TC, TG, HDL, LDL and non-HDL-C (1413, 1081, 1020 and 1078) has been shown to be (73.3%) with low risk of TC and TC (12.03%) with high risk ranges, a (23.17%) with a high risk for TG, also with a high risk percentage (71.27%) a high risk of HDL, and high LDL had a (10.32%) while Non-HDL-C had (36.5%) in the high risk range.

Table (3) shows the no. of samples and the percentage for total population

	Low Risk	Border line	high risk
TC	1036 (73.3%)	207 (14.64%)	170 (12.03%)
TG	680 (63.55%)	143 (13.36%)	248 (23.17%)
HDL	293 (28.73%)		727 (71.27%)
LDL	693 (68.13%)	219 (21.53%)	105 (10.32%)
Non-HDL-C	685 (63.5%)		393 (36.5%)

Lipid parameters among different genders

The Measurement of lipid profiles among Iraqi male pediatrics is demonstrated in (Table 4a.) Total mean TC level (5.4 mg\dl), TG level (2.4 mg\dl), HDL level (1.6 mg\dl) and LDL level (3.03 mg\dl), while (Table 5a.) Total mean TC level (4.4 mg\dl), TG level (1.6mg\dl), HDL level (2.0 mg\dl) and LDL level (2.9 mg\dl), when calculating the control was calculated to be in a mean of (5.2, 1.7, 3.4, 4.3 mg\dl respectively) for male and (5.0, 1.5, 3.5, 4.2 mg\dl respectively) for female. Also the result showed an increase in all lipid parameters except HDL which showed decreased levels in both genders

Table (4b) demonstrates the male samples size as (324, 216, 151, 195 for TC, TG, HDL and LDL respectively) the result showed high TC with a percentage of (25.9%), a (45.8%) had a high TG, also (100%) of low HDL and high LDL had a (31.8%). Table (5b) demonstrate the female samples size as (353, 274, 266, 266 for TC, TG, HDL and LDL respectively) the result showed high TC with a percentage of (27.5%) , a (30.7%) had a high TG, also the percentage of low HDL were (61%) and high LDL had a (32%).

Table (4a) shows the means for the male population

	TC	TG	HDL	LDL
Average	5.4	2.4	1.6	3.03
C. high	9.9	2.8	1.5	4.9
TG high	5.3	4.1	1.6	4.5
HDL low	4.3	2.2	0.9	2.9
LDL high	5.9	2.3	1.2	6.2

Table (4b) shows the no. of samples and the percentage for the male population

	TC	TG	HDL	LDL
No of sample	324	216	151	195
C. high	84(25.9%)	42 (19%)	26 (17%)	37 (18%)
TG high	42(13%)	99 (45.8%)	71 (47%)	192 (98.5%)
HDL low	26 (8%)	71 (32.8%)	151 (100%)	44 (22.6%)
LDL high	37 (11%)	35 (16%)	44 (29%)	62 (31.8%)

Table (5a): shows the means for the female population

	TC	TG	HDL	LDL
Average	4.4	1.6	2.0	2.9
C. high	6.3	2.5	1.4	5.8
TG high	5.3	2.9	1.2	4.5
HDL low	4.2	1.6	1.02	2.9
LDL low	5.8	2.1	3.8	4.2

Table (5b): shows the no. of samples and the percentage for the female population

	TC	TG	HDL	LDL
No of sample	353	274	266	266
C. high	97 (27.5%)	36 (13%)	27 (10%)	55 (20.7%)
TG high	27 (7.7%)	84 (30.7%)	49 (18%)	42 (15.8%)
HDL low	27 (7.7%)	42 (15%)	164 (61.7%)	47 (17.7%)
LDL high	51 (14.5%)	42 (15%)	47 (17.7%)	85 (32%)

Lipid parameters among different ages

While the lipid profiles among Iraqi pediatrics under the age of 7 years is demonstrated in (Table 6a.) the calculated total mean of TC level were shown to be (4.7 mg\dl), TG level (4.3 mg\dl), HDL level (1.2 mg\dl), LDL level (3.1 mg\dl), and non-HDL-C level (3.6 mg\dl) while the control was calculated to be in a mean of (5.2, 1.7, 1.31, 3.4, 4.3 mg\dl respectively). The result showed that when TG was high the lipid parameters is shown to be (5.5, 9.6, 1.1, 3.7, 4.4 mg\dl respectively). Table (6b) demonstrate the male samples size as (453, 432, 443, 430, 453 for TC, TG, HDL, LDL and non-HDL-C respectively) the result showed that there is a (119) sample that had a high TC with a percentage of (26%). 71% of the samples had a low HDL levels, while only 12.8% had an elevated TC when HDL was low.

Table (6a): shows the means for the total sample population ranging from the age of 2 to the age of 6 years

	TC	TG	HDL	LDL	NON-HDL
Average	4.7	4.3	1.2	3.1	3.6

C. high	6.6	12.3	1.4	4.7	5.2
TG high	5.5	9.6	1.1	3.7	4.4
HDL low	4.3	1.8	0.96	2.9	3.3
LDL low	6	10.02	1.3	4.5	4.8
NONHDL	5.5	6.8	1.2	3.8	4.4

Table (6b): shows the no. of samples and the percentage for the total sample population ranging from the age of 2 to the age of 6 years

	TC	TG	HDL	LDL	NON-HDL
No of sample	453	432	443	430	453
C. high	119 (26%)	84 (19%)	58 (13%)	101 (23%)	119 (26%)
TG high	84 (18.5%)	166 (38%)	123 (27.8%)	81 (18%)	131 (28%)
HDL low	58 (12.8%)	123 (29%)	314 (71%)	96 (22%)	175 (38%)
LDL high	101 (22%)	151 (35%)	96 (22%)	146 (34%)	146 (32%)
Non-HDL-C	119 (26%)	131 (30%)	175 (40%)	146 (34%)	259 (57%)

On the other hand of lipid profiles among Iraqi pediatrics in an age range of 7- 12 years is demonstrated in (Table 7a.) were the total mean TC level (4.6 mg\dl), TG level (1.8 mg\dl), HDL level (1.2 mg\dl), LDL level (3 mg\dl) and non-HDL-C level (3.4mg\dl) while the control was calculated to be in a mean of (5.2, 1.6, 1.3, 3.4, 4.3 mg\dl respectively). Table (7b) demonstrate the samples size as (292, 282, 294, 279, 294 for TC, TG, HDL, LDL and non-HDL-C respectively) the result showed that there is a (77) sample that had a high TC with a percentage of (26%) , a (38%) had a high TG, also the percentage of low HDL were (70%), while high LDL had a (33%) and non-HDL-C had (50%). 35% of the samples had a high non-HDL-C when HDL was low, while only 15% had a low HDL when TC was elevated.

Table (7a) shows the means for the total sample population ranging from the age of 7 to the age of 12 years

	TC	TG	HDL	LDL	NON-HDL
Average	4.6	1.8	1.2	3	3.4
C. high	6.5	2.7	1.3	4.5	5.1
TG high	5.4	3.2	1.01	3.4	4.1

HDL low	4.2	1.95	0.9	2.9	3.3
LDL low	5.96	2.4	1.2	5.7	4.8
NON-HDL	5.6	2.5	1.2	3.8	4.4

Table (7b) shows the no. of samples and the percentage for the total sample population ranging from the age of 7 to the age of 12 years

	TC	TG	HDL	LDL	NON-HDL
No of sample	292	282	294	279	294
C. high	77 (26%)	56 (20%)	44 (15%)	63 (23%)	77 (26%)
TG high	56 (19%)	109 (38%)	86 (29%)	54 (19%)	83 (28%)
HDL low	44 (15%)	86 (31%)	209 (70%)	61 (22%)	102 (35%)
LDL high	63 (22%)	98 (35%)	61 (21%)	91 (33%)	91 (31%)
NON-HDL	77 (26%)	83 (29%)	102 (35%)	91 (33%)	148 (50%)

Finally the lipid profile among Iraqi pediatrics ranging between the ages of 13-17 years is demonstrated in (Table 8a.) Total mean TC level (4.4 mg\dl), TG level (1.7 mg\dl), HDL level (1.2 mg\dl) LDL level (2.9 mg\dl), and non-HDL-C level (3.2 mg\dl), while the control was calculated to be in a mean of (5.2, 1.7, 1.3, 3.4, 4.3 mg\dl respectively). Also the result showed that when the TC is high the lipid parameters is shown to be (6.1, 2.4, 1.4, 4.2, 4.7 mg\dl respectively).

Table (8b) demonstrate the male samples size as (326, 316, 328, 318, 329 for TC, TG, HDL, LDL and non-HDL-C respectively) the result showed that there is a (72) sample that had a high TC with a percentage of (22%). 91% of the samples had a high LDL, while only 13% had an elevated TC when HDL were low.

Table (8a) shows the means for the total sample population ranging from the age of 13 to the age of 17 years

	TC	TG	HDL	LDL	NON-HDL
Average	4.4	1.7	1.2	2.9	3.2
C. high	6.1	2.4	1.4	4.2	4.7
TG high	5.2	3.2	1.1	3.4	4.1

HDL low	4.2	1.9	0.99	2.9	3.3
LDL low	5.7	2.1	1.2	4.	4.4
NON-HDL	5.3	2.2	1.2	3.6	4.1

Table (8b) shows the no. of samples and the percentage for the total sample population ranging from the age of 13 to the age of 17 years

	TC	TG	HDL	LDL	NON-HDL
No of sample	326	316	328	318	329
C. high	72 (22%)	47 (15%)	41 (13%)	60 (19%)	72 (22%)
TG high	47 (14%)	103 (33%)	80 (25%)	48 (15%)	79 (24%)
HDL low	41 (13%)	80 (25%)	235 (72%)	64 (20%)	119 (36%)
LDL high	60 (18%)	92 (29%)	64 (20%)	91 (29%)	89 (27%)
NON-HDL	72 (22%)	79 (25%)	119 (36%)	89 (28%)	164 (50%)

DISCUSSION

Dyslipidemia is a prevalent occurrence in pediatrics. Selective screening typically misses its increasing prevalence because of this (Amy L. Peterson et al; 2012).

High levels of TC, TG, LDL, Non-HDL-C, and low HDL in pediatrics enhance their risk of cardiovascular disease, according to our findings. Atherosclerotic dyslipidemia is characterized by high levels of LDL-C, a key risk factor for cardiovascular disease (piepoli MF ,*et al*; ,Eur Heart J. 2016).

Our findings suggest that (>13%) of the population is in serious condition, with (>23%) having elevated TG levels. A number of population studies and meta-analyses have demonstrated a strong link between TG levels and cardiovascular disease risk, even when controlling for other risk variables such as HDL-C levels (Assmann G *et al*; 2007).

Genetic risk factors should be identified because they are often overlooked. A child's cardiovascular risk factors are commonly underestimated since they are difficult to identify. Even if risk factors are appropriately identified, studies have demonstrated that confining lipid screening to patients with risk factors does not uncover many patients with genetic or acquired dyslipidemia. Many at-risk youngsters will go unnoticed if there is no systematic screening implemented. (Amy L. Peterson et al; 2012).

Our study found a significant difference between children and biological controls, but no significant difference was found between men and women in the general population. McNeal *and his team* in 2013 results showed that men were more likely than women to have dyslipidemia (37.9% vs 27.5%), but

postmenopausal women were more likely to have dyslipidemia (except for low HDL-C). However, dyslipidemia was found in fewer Han and Mongolian people (29.1% vs 31.4%) than in other groups. Men, urban living, Han nationality, smoking, obesity, central obesity, hypertension, and diabetes are all linked to dyslipidemia. Alcohol use is linked to a lower risk of dyslipidemic disease. (yunfeng Xi, et al; ; 2020). According to a different study done by Rev Bras Epidimol in 2012, being overweight, not getting enough nutrition, and having a low maternal education level were all linked to dyslipidemia.

While this is true, our research provides a head start in treating pediatric dyslipidemia in Iraq. Males (25.9%) had lower TC when compared with TG levels of females (27.5%), the study found. Males (61%) have lower HDL (100%) than females (61%) and, as a result, males (31.8%) have greater LDL than females (31.8%) (32%).

State guidelines, recently announced by the Expert Committee on Cholesterol Education Program, call for a comprehensive screening of all children aged 9 to 11 and the use of a non-fasting lipid test again between the ages of 17 and 21, to identify children with stage 2 dyslipidemia (Neil C. et al; ; 2013).

This recommendation differs from that of the 2007 USPSTF for screening children and adolescents for dyslipidemia (Kavey RW et al; ., 2011)

Iraq lacks both a survey and records on dyslipidemia in children. According to three surveys carried out in China between 2002 and 2015, dyslipidemia is becoming more common in Chinese adults(Zhou L. et al; ; 2019). With TC, TG, LDL-c, and non-HDL-C all rising in prevalence. However, dyslipidemia was not more prevalent in the sub-age group, especially in those with low HDL-c levels. HDL-C level and fat related ratios were seen in all genders, regions, and BMI categories. According to these findings, Chinese individuals require more effective methods of controlling dyslipidemia and preventing cardiovascular disease (Kun et al; ; 2019).

National Cholesterol Education Program (NCEP) JAMA. Changes in the general population's blood lipid levels were regarded as a typical warning sign of coronary atherosclerosis in the United States in 2001.

Atherosclerotic cardiovascular disease is a major public health issue in many countries, including Brazil (III Brazilian Guidelines on Dyslipidemias, 2001). This is because many people with lipid disorders go undiagnosed or undertreated, resulting in an unfavorable blood lipid profile and a higher risk of coronary events (Gotto AM, 2003).

Non-fasting TG levels have been compared to fasting TG levels as a way to predict CVD risk, with some studies finding a stronger link between non-fasting TG levels and CVD risk than fasting TG levels (Mora S, et al; 2008). High TG and low HDL-C values are common among patients seeking primary prevention for cardiovascular disease. To prevent potential premature coronary heart disease, screening should begin as early as possible in life (Tab. 3), given the significant frequency of poor elevated lipid profiles in children found in the current study.

Conclusion

Twelve percent of the juvenile population has a high cholesterol risk, whereas 71.27% of pediatric has low HDL imply prevention and conduct of necessary tests since infancy before the situation worsens, especially in young people, which leads to heart disease and atherosclerosis.

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