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Lipid profile of diabetic patients at Murzuk general hospital, southern Libya

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Abstract: The objective of this study was to evaluate the level of lipids in diabetic patients and its relation to age and sex. The samples included were 149 diabetic patients comprising of 89 males and 60 females with age range between 14 - 76 years old. Blood samples were collected from these patients who regularly come to Murzuk general hospital. The blood sample was analyzed for the levels of TC, TG, LDL and HDL by a spectrum analysis, spectrophotometer. The results showed that the percentage value of samples with normal result for TC, TG, LDL and HDL are 100 (67.1%), 121 (81.2%), 127 (85.2%), 73 (males & female) {41 (53.3%), 32 (46.1%)} as well as the percentage value of samples with abnormal results, 49 (32.99%), 28 (18.8%), 22 (14.8%), 76 (M & F) {28 (46.7%), 48 (53.9%)}, respectively. The mean values for male samples with normal result of TC, TG, LDL and HDL are {(156.4 ± 27.3), (118.9 ± 42.2), (79.0 ± 23.5), (45.7 ± 10.7, 48.0 ± 3.5) mg/dl} for female, respectively. The mean values for male samples with abnormal results {(239.6 ± 24.2), (285.2 ± 59.2), (173.5 ± 35.3) and (25.1 ± 8.1, 27.0 ± 10.0) mg/dl} for females. This study shows that the prevalence of high levels of lipids in female diabetic patients at middle-aged, and at elderly age among male patients. The study further suggests that age has an effect on blood lipid disorders in diabetic patients.

Keywords: Diabetes mellitus, diabetes type II, blood lipids, lipid profile, Libya.

Introduction

Disorder in lipids (dyslipidemia) is usually common in diabetic patients and possesses a high risk factor for cardiovascular disease. Lipid disorders associated to diabetes is most commonly seen in people with metabolic disorders such as insulin resistance and in patients with diabetes type II (1). Characteristics of diabetic patients include a high level of concentration of triglyceride (TG), lack of high-density lipoproteins (HDL) and high concentration of very low density lipoproteins (VLDL). This is manifested by a slight increase in (although non-significant) the level of concentration of low density lipoproteins (LDL) compared to non-diabetics which gives rise to increased risk of atherosclerosis and produces the susceptibility of LDL to oxidation even with this very minimum increase. Most of these cases are accompanied by a high proportion of apolipo-protein (Apo-P) (1, 2). Lipoproteins are closely related to atherosclerosis. This relation between cholesterol and atherosclerotic disease was reported in multiple large epidemiologic studies such as the study (3, 4). These and many other observational studies formed the basis of the "cholesterol hypothesis" that the relationship between serum cholesterol and atherosclerosis is causal and that reduction of serum cholesterol would reduce atherosclerotic disease.

Lipid disorders associated with diabetes type I, which is insulin dependent diabetes, have little difference in the level of lipid concentration in blood compared to non- diabetes, despite the presence of abnormal condition in the composition of particles of lipoprotein (5, 6).

The presence of a large amount of glucose deposited in cells and mostly in hepatic cells has a strong effect on increasing lipid storage and this is considered as one of the effects of insulin resistance.

Insulin is a hypoglycemic hormone secreted from β-cell of the islet of pancreas and has an effect on lipid metabolism. In the absence of insulin, the lipid is not stored in cells, but is released in the form of ketone bodies as reflected in the circulatory system, and used by cells in the body (6).

Insulin deficiency causes excessive metabolism of free fatty acids, which may lead to a disorder in lipid metabolism. A side from the high concentration of sugar and lipids in the blood, there are other factors that highly contribute to the development of atherosclerosis in patients with diabetes, these include but not limited to smoking, abnormalities in blood platelets and clotting factors and chronic high lipids and high concentration of cholesterol in the blood (7). All these factors results to the accumulation of lipoprotein around the inner lining of the blood vessels which is further converted by oxidation to LDL, that leads to hardening of the arteries (8, 9).

Materials and methods

A total number of 149 diabetic patients (60 males and 89 females) from Murzok General Hospital, with age range between 14 - 76 years old were used as respondents of the study. Venous blood samples were collected after fasting for 8 - 12 hours. The serum samples were then separated and stored at a temperature of - 20 ^{o}C and later assayed for determination of cholesterol (TC), triglycerides (TG), low density lipoprotein (LDL) and high density lipoprotein (HDL) using a spectrum analyzer (spectrophotometer) and "Biocon Comp." reagents .
The Minitab Graph Statistical Analysis program was primarily used for statistical treatment and analysis of the results of the study.

The manufacturers of the assay kits recommended the following ranges as basis for determination of the TC, TG, LDL & HDL are ≤ 200, ≤ 200, ≤ 135, (males ≥ 35, female ≥ 45, mg/ml), respectively.

Results

The results of the present study are presented and categorized into two groups; first the respondents that belong within the normal level values and second the respondents with abnormal level of lipid profiles, as shown in table (1). Cholesterol (TC) levels of patients with diabetes. The results of this study revealed that 100 (67.1%) have normal TC levels and 49 (32.99%) belonged within abnormal levels. The mean value of TC concentrations of the samples with normal TC level is (156.4 ± 27.3 mg/dl) and (239.6 ± 24.2 mg/dl) for those with abnormal results. From the two sets of results, namely the normal and abnormal category, there is a mean value difference of $p < 0.01$ of level of triglycerides (TG) in patients with diabetes. The results showed that 121 respondents (81.2%) have normal levels of TG and 28 (18.8%) are within abnormal levels. The mean value of TG concentration in normal results is (118.9 ± 42.2 mg/dl) and (285.2 ± 59.2 mg/dl) in respondents with abnormal TG levels.

It is further revealed that between diabetic patients with normal and abnormal TG results, there is a significant mean value difference of $p < 0.01$ of levels of low density lipoproteins (LDL) in diabetic patients. The results of the study indicate that 127 (85.2%) respondents have normal LDL results and 22 (14.8%) have abnormal result value. The mean value of LDL concentration in patients with normal result value is (79.0 ± 23.5 mg/dl) and (173.5 ± 35.3 mg/dl) for patients with abnormal results. These two mean values of LDL concentration have significant mean difference of $p < 0.01$.
Levels of HDL in diabetic patients. As shown in Figure 1, the data revealed levels of HDL for both males and females. Normal HDL

results showed {41 (53.3%) and 32 (46.1%)} and abnormal HDL results of {28 (46.7%) and 48 (53.9%)}. The mean value of HDL concentration in samples with normal result value is (45.7 ± 10.7, 48.0 ± 3.5 mg/dl) and (25.1 ± 8.1, 27.0 ± 10.0 mg/dl) for respondents with abnormal HDL result. The study showed significant $p < 0.01$ difference in mean values between males and females with normal and abnormal HDL levels.

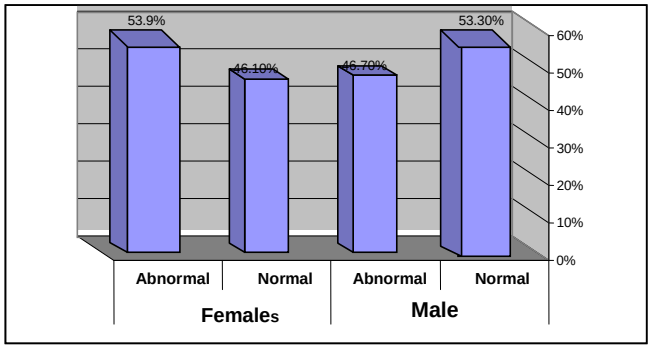

Figure 1: Normal and abnormal percentage (%) Results of HDL for males and females

For the TC test in this group of 20 samples (13.4%), 19 (19%) were found to be within normal range values and 1 (2%), was found to have abnormal results. The mean concentration value of CT for respondents with normal TC level is (154.7 ± 25.8 mg/dl) and (237 mg/dl) for those that have abnormal TC levels. Out of 20 samples (13.4%) tested for triglycerides (TG), 19 (15.7%) were found to be within normal levels and only one (3.6%) was revealed to have abnormal result. The mean concentration values of TG for samples with normal result value is (110.5 ± 33.6 mg/dl) and (258 mg/dl) for those with abnormal result. The LDL test for 22 (14.8%) samples showed that 18 (14.2%) were found to be within the normal values and 4 (18.2%), belonged to the abnormal range. The mean concentration values of LDL for normal results is (81.9 ± 25.4 mg/dl) and (198.7 ± 38.7 mg/dl) for those with abnormal result. HDL test was also conducted for this group of males and females {10 (16.7%), 20 (22.5%)}, it clearly showed results of {6 (18.8%), 10 (24.4%)} with normal result values and {4 (14.3%) 10 (20.8%)} were found to be within abnormal levels.

Table 1: Percentage and mean values of normal and abnormal lipid results of the samples

	TC		TG		LDL		HDL			
							Female		Male	
	AbN	N	AbN	N	AbN	N	AbN	N	AbN	N
Number & Percentage of samples	49 32.99 %	100 67.1%	28 18.8%	121 81.2%	22 14.8%	127 85.2%	48 53.9%	41 46.1%	28 46.7%	32 53.3%
Mean values (mg / dl)	239.6 24.2±	156.4 27.3 ±	285.2 59.2±	± 118.9 42.2	173.5 ±35.3	79.0 23.5 ±	27.0 10.0 ±	48.0 3.5±	25.1 8.1±	45.7 10.7 ±

The percentage and mean values of normal and abnormal lipids per age group of diabetic patients, as shown in Tables 2 and 3: Age group of 1-35 years, AbN is abnormal and N is normal.

The mean concentration values of HDL for samples with normal result is (48.7 ± 5.1, 62.2 ± 11.8 mg/dl) and (27.3 ± 6.6, 25.8 ± 9.0 mg/dl) for samples with abnormal results.

Age group of 36-55 years: The TC test for this age-group of 85 (59.7%) samples, 57 (57%) were found to be within normal values and only 28 (57.1%) have abnormal results. The mean concentration value of TC for samples with normal results is (159.2 ± 31.5 mg/dl) and 248.4 ± 36.6 mg/dl for samples with abnormal results. The TG tests of 76 (51%) samples and the results showed that 60 (49.6%) were found to have normal result

value and 16 (57.1%) are with abnormal findings. The mean concentration values of TG for samples with normal results are 125.2 ± 44.7 mg/dl and 294.8 ± 62.2 mg/dl for samples with abnormal findings. The LDL tests samples a total number of 82 (55%) samples and the results showed that 71 (55.9%) were found to have normal results and 11 (50%) samples are with abnormal result value. The mean concentration values of LDL for samples with normal result value is 78.8 ± 39.5 mg/dl and 215.8 ± 43 mg/dl for samples found to have abnormal result value.

The data also revealed result of the test for the HDL of males and females for this group {20 (33.3%), 51 (57.3%)}. The results showed that 8 (25%) 26 (63.4%) were all found to be within normal values and 12 (42.9%), 25 (52.1%) are within abnormal levels. The mean concentration values of HDL for normal results are 47.3 ± 6.7, 48.5 ± 3.5 mg/dl and 27.3 ± 8.2, 24.8 ± 8.1 mg/dl for those with abnormal results.

Age group of 56 years and above: TC tests were also conducted for this group with a total number of 44 (73.3%) samples and result showed that 24 (24%) were found to have normal result value and 20 (40.8%) are with abnormal results. The mean concentration values of TC for samples with normal results are 157 ± 28.2 mg/dl and 239.4 ± 41.3 mg/dl for those with abnormal results.

The triglycerides were tested for 53 (35.6%) samples and revealed results that 42 (34.7%) of the samples were found to have normal TG level and 11 (39.3%) have abnormal results. The mean concentration values of TG for normal result values is 117.9 ± 41 mg/dl and 269.7 ± 51.7 mg/dl for abnormal. LDL tests were conducted for 45 (30.2%) samples and the results showed that 38 (29.9%) were found to be with normal result values and 7 (31.8%) have abnormal results. The mean concentration values of LDL for normal value results is 73.5 ± 36.4 mg/dl and 187.9 ± 13.6 mg/dl for samples with abnormal results.

The HDL test of males and females for this grouping {30 (50%) 0.18 (20.2%)} showed that 10 (31.3%), 0.5 (12.2%) were found to be within the normal values and 12 (42.9%), 13 (27.1%) were categorized as abnormal. The mean concentration valuesof HDL for normal results is 44.2 ± 6.6, 55 ± 4.5 mg/dl and 23.2 ± 7.6, 32.4 ± 6.2 mg/dl for abnormal.

Table 2: Percentage of normal and abnormal lipids per age group of diabetic patients

Age group %	TC		TG		LDL		HDL			
							Female		Male	
	AbN	N	AbN	N	AbN	N	AbN	N	AbN	N
1-35 year	1(2%)	19(19%)	1 (3.6%)	19(15.7%)	4(14.2%)	18(14.2%)	10(20.8%)	(24.1%) 10	4(14.3%)	(18.8%) 6
36-55 year	28(57.1%)	57(57%)	16 (57%)	60(49.6%)	11(50%)	71(55.9%)	25(52.1%)	26(63.4%)	12(42.9%)	8(25%)
Over 56 year	20(40.8%)	24(24%)	11(39.3%)	42(34.7%)	7(31.8%)	38(29.9%)	13(27.1%)	5(12.2%)	12(42.9%)	(31.3%) 10

AbN is abnormal and N is normal.

Table 3: Mean values of normal and abnormal lipid per age group of diabetic patients

Mean values (mg/dl)	CT		TG		LDL		HDL			
							Female		Male	
	AbN	N	AbN	N	AbN	N	AbN	N	AbN	N
< 35 years	237	±154.7 25.8	258	±110.5 33.5	±198.7 38.7	81.9 25.4±	±25.8 9.0	62.2 11.8±	±27.3 6.6	5.1 ±48.7
36-55 year	248.4 36.6±	±159.2 31.5	±294.8 62.2	±125.2 44.7	215.8 43±	±78.8 39.5	±24.8 8.1	48.5 3.5±	±27.3 8.2	6.7±47.3
> 56 years	239.4 41.3±	157 28.2±	269.7 51.7±	±117.9 41	187.9 13.6±	73.5 36.4±	±32.4 6.2	±55 4.5	23.2 7.6±	6.6 ±44.2

AbN is abnormal and N is normal.

Discussion

This study shows that 30% of the respondents with diabetes suffer from disorders in the level of concentration of blood lipids. However, this result is significantly lower in comparison to other similar global studies conducted in America, with a result of 70% and in Finland with 85% (10, 11). Regional studies revealed 50% sufferers in Sudan, Kuwait and Nigeria (12 - 14) with low level concentration of HDL found to be higher in women than in men and similarly among women in Nigeria (15). The study also showed significant differences between the mean values for the concentration of normal and abnormal components of each lipid profiles in diabetic patients. The results show that high levels of lipid in female diabetic patients were at age group of 36 - 55 years old whereas in males were in 56 years and above.

The mean values were carried out by statistical analyses. The age group of 36 - 55 years old has the highest level of concentration for abnormal CT, TG and LDL but the highest concentration of the mean values for abnormal HDL was found to be in males at age over 55 years old and for females at age group between 36 - 55 years.

In conclusion, the study concluded that age has an effect on blood lipid disorders in patients with diabetes. High levels of lipids in patients with diabetes are found among middle -aged women while in men among the elderly. This study further concluded that the percentage results of diabetic patients conducted at Murzuk General Hospital have lower rates of lipid disorders as compared to other reported studies.

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