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KLİNİK ARAŞTIRMA *Dahiliye*

Diabetic dyslipidemia

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SUMMARY

Diabetes Mellitus is a chronic hyperglycemic metabolic disease leading to disorders of carbohydrate, lipid and protein metabolism due to deficiency of insulin function and insulin hormon secretion. By the year 2025, the World Health Organization projects more than 300 million cases worldwide. Diabetes mellitus is an independent risk factor for cardiovascular disease and this risk increases further with accompanying dyslipidemia. Diabetic dyslipidemia is characterized by hypertriglyseridemia, decreased levels of HDL-cholesterol particles and increased small and dense LDL-cholesterol particles. This lipid profile, also named as toxic triad, coexists in the patient long before diabetes can be diagnosed.

In our study, we investigated diabetes prevalence and its relationship with plasma lipids and other related parameters in 30745 patients attending to our internal medicine clinic between August 2006 and May 2007. We detected high statistical correlation between fasting blood glucose and total cholesterol, triglyseride, HDL- cholesterol concentrations. Total cholesterol, TG levels were increased whereas HDL-cholesterol levels were decreased, on the other hand, blood glucose concentrations were elevated. We found out that relationships between Hba1c levels and total cholesterol, TG, HDL-cholesterol levels were statistically significant too.

The majority of type 2 diabetic patients are dyslipidemic. Optimization of lipid profile in these patients is the most important intervention needed for the improvement of cardiovascular mortality/morbidity and for the reduction of risks related to the procedures of coronary death, MI, stroke and revascularization.

Key words: *Diabetes mellitus (DM), dyslipidemia*

ÖZET

Diabetik dislipidemi

Diabetus mellitus, insulin fonksiyon ve sekrasyonu bozukluğuna bağlı, karbonhidrat, lipid ve protein metabolizmasının kronik hiperglisemik metabolik hastalığıdır. Dünya Sağlık Örgütüne göre 2025 yılında dünyada 300 milyon olgu olacaktır. Dibetus mellitus kardiyovasküler hastalıklar için bağımsız risk faktörü olup dislipedemiye bağlı olarak risk artar. Diabetik dislipidemi trigiliserid yüksekliğiyle karekterizedir, HDL seviyesi düşük ve LDL seviyesi yüksektir. Bu lipid profili "toksik üçlü" olarakta adlandırılır ve diabet teşhisinden çok önce ortaya çıkar.

Çalışmamızda, 2006 Ağustos- 2007 Mayıs ayları arasında dahiliye kliniğimize başvuran 30745 hastanın diabet prevalansı ve plazma lipid değerleri ile ilişkisini araştırdık. Kan glukoz ve total kolesterol, triglisetid, HDL-kolesterol konsantrasyonları arasında istatistiksel bağıntı olduğunu tespit ettik. Total kolesterol, triglisetid yükselirken, HDL-kolesterol seviyesi düşmektedir, diğer yandan kan glukoz seviyesi artmaktadır. Hba1c ve total kolesterol, triglisetid, HDL-kolesterol seviyeleri arasındada istatistiksel ilişki tespit edilmiştir.

Tip 2 diabetli hastalar dislipidemiktir. Hastaların lipid seviyelerini normal sınıra çekmek kardiyovasküler morbidite ve mortaliteyi azaltılabilir ve koroner hastalıklara bağlı ölüm, mitokart infarktüsü, inme riskini azaltır.

Anahtar kelimeler: *Diabetus mellitue, dislipidemi*

Diabetes Mellitus, caused by relative or definite insulin deficiency or by insulin resistance is a progressive chronic disease leading to hyperglycemia, characterized by disorders of carbohydrate, lipid and protein metabolism. Diabetes, recently considered as an epidemic, is a worldwide health problem with ongoing increasing incidence and disabling complications. By the year 2025, the World Health Organization projects more than 300 million cases [(1)]. Even though there is a worldwide increase in the prevalence of both type 1 and type 2 DM, it is estimated that in the future type 2 DM will prevail as obesity frequency augments while physical activity diminishes [(23)]. In last two decades, the

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prevalence of DM dramatically increases with aging; it is determined to be around 1,5 % in patients aged between 20-39 years whereas it is around 20 % in those with more than 75 years of age. In addition, there are disparities in the prevalence rate all around the world [2]. Based on [3], diabetes prevalence in year 2000 is 2,8 % in the world, and is estimated to be 4,4 % in year 2030. Turkey, with its large land area,growing economy, more than 65 million inhabitants, is a country where awareness of diabetes is still poor. Satman et al., in their cross-sectional, population based survey named TURDEP (Turkish Diabetes Epidemiology Study) investigated for the first time the prevalence of diabetes and impaired glucose tolerance nationwide in Turkey. Their survey included 24788 subjects and found out that crude prevalence of diabetes was 7,2 % and of impaired glucose tolerance (IGT) 6.7 % [4]. In this study, impaired glucose tolerance was increasing with age and was seen in elderly patients more frequently than type 2 DM. As a conclusion diabetes and IGT are moderately common in Turkey by international standarts.

Glycemic control in diabetics was not sufficient to prevent cardiovascular events as atherotrombotic process were already present during prediabetic era [5-7]. High total cholesterol and LDL-C levels as well as low HDL-C concentrations are important factors for atherothrombotic vascular diseases and they could be reduced with proper treatment. During this process continuing over years, atherosclerosis can lead to mortal events; beginning with endothelial disfunction, than ursuing with fatty streak composition and ending with atherosclerotic plaque [8,9]. Plaque rupture will lead to severe events like myocardial infarction and cerebrovascular collapses. Dyslipidemia is a well known factor leading to atherosclerosis. In multiple studies, reducing LDL-C levels cause a decrease in cardiovascular event frequencies [10,11].

Type 2 diabetes is associated with a cluster of interrelated plasma lipid and lipoprotein abnormalities, including reduced HDL cholesterol, a predominance of small dense LDL particles, and elevated triglycerides. These changes are related with insulin resistance and increased free fatty acid levels. At the level of adipocyte, impaired insulin action leads to increased rates of intracellular hydrolysis of triglycerides with the release of free fatty acids and provides substrates for the liver. Plasma VLDL levels are raised. İncreased VLDL levels are associated with post-prandial hyperlipidemia that is compounded by impaired lipoprotein lipase activity. Plasma HDL-C levels are reduced. LDL-C particles become small and dense. They are held to be more atherogenic than their larger counterparts because they are more liable to oxidation and may more readily adhere to and subsequently invade the arterial wall. The atherogenicity of LDL-C may also be enhanced by nonenzymatic glycation. Although attainment of better glycemic control may improve diabetic dyslipidemia, pharmacological intervention is usually required [24].

The main objective of this trial is to investigate relationships between biochemical markers, plasma lipid levels and diabetes prevalence in patients attending to our out-patient clinic because we are interested in the relationship between diabetes and dyslipidemia which is mentioned as ‘atherogenic triad’. Diagnosis and treatment of dyslipidemia in patients with diabetes is important in reducing the high morbidity and mortality from macrovascular disease.

MEASUREMENT and DATA COLLECTION

This trial was conducted in Göztepe Hospital, at the Merdivenköy out-patient clinics, during August 2006-May 2007. All patients (30745) aged more than 20 years, were included and possessing in their file measurements of fasting blood glucose, Hb A1C and lipid parameters. Prohibited concomitant illnesses were CA, pregnancy, chronic nephritis, etc. This study was performed retrospectively by screening all patients files and noting fasting blood glucose, triglyceride, total cholesterol,

LDL-C, HDL-C, HbA1C levels.

Statistical Analysis Method

All statistical analysis were conducted NCSS 2007&PASS 2008 Statistical Software (Utah, USA). In addition to statistical analysis such as mean, standard deviation, we used Chi-Square tests for non-parametric analysis. Use Active instead of Passive Voice through out the paper. Passive Voice is more difficult to understand. Results were detected with 95 % power and a significance level of <0.05.

RESULTS

Demographic characteristics are detailed in table 1. In this study, 30745 patients were included, their ages ranged between 20-99 with an average of 54,67±13,89 years. 27,9 % of these patients aged between 50-59 years. 10126 of these individuals were male (32,9 %), whereas 20619 of them were female (67,1 %).

Table 1. Demographic characteristics.

		n	%
Age	20-29 years	1338	4,4
	30-39 years	2827	9,2
	40-49 years	6456	21,0
	50-59 years	8593	27,9
	60-69 years	6888	22,4
	> 70 years	4643	15,1
Females/Males	Females	20619	67,1
	Males	10126	32,9

Biochemical measurements results are shown in table 2. HDL-C average concentration was 45,71±12,87 mg/dL. Mean levels of LDL-C, TG, and Total cholesterol were detected as 120,03±36 mg/dL, 172,95±118,91 mg/dL and 200,7±60,63 mg/dL respectively. The number of patients with LDL-C less than 100 mg/dL was 8276 (29,2 %). The ratio of patients with TG levels less 150 mg/dL was 52,9 %, those with total cholesterol levels less than 200 mg/dL were in a percentage of 51,7 %.

Table 2. Biochemical parameters.

		n	%
HDL (45,71±12,87)	M <40; F<50	16654	57,1
	M>40; F>50	12508	42,9
	< 100	8276	29,2
LDL (120,03±36,96)	101-130	9752	34,4
	131-159	6524	23,0
	160-189	2815	9,9
	> 190	980	3,5
TG (172,95±118,91)	< 150	16139	52,9
	151-199	5681	18,6
	200-499	8056	26,4
	> 500	642	2,1
Total cholesterol (200,70±60,63)	< 200	15860	51,7
	201-239	9362	30,5
	> 240	5474	17,8
FBG (115,78±48,45)	< 100	15399	50,2
	100-125	9079	29,6
	> 126	6220	20,3
Hb1Ac (7,86±7,42)	< 6	2029	32,6
	6,1-6,5	1265	20,4
	6,6-7	490	7,9
	7,1-7,5	439	7,1
	7,6-8	1992	32,1

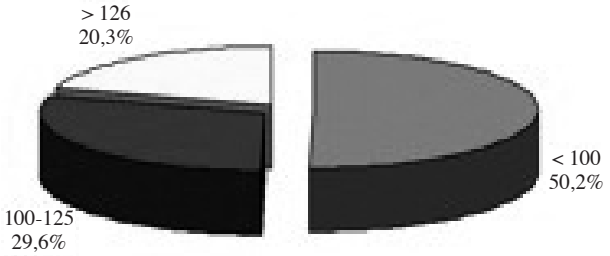

Figure 1. Ranges of fasting blood glucose levels.

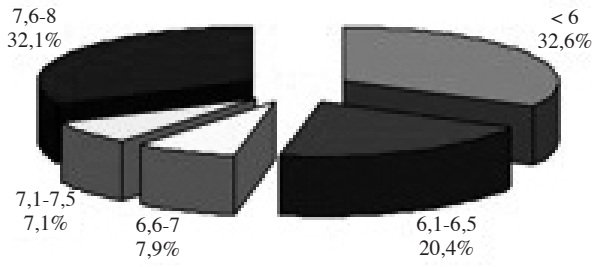

Figure 2. HbA1c distribution.

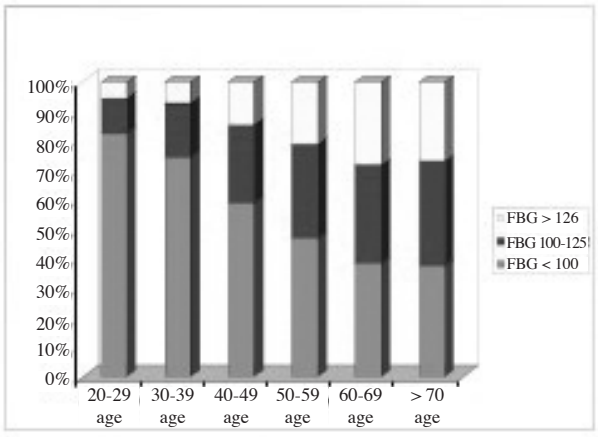

Figure 3. Distribution of FBG according to age.

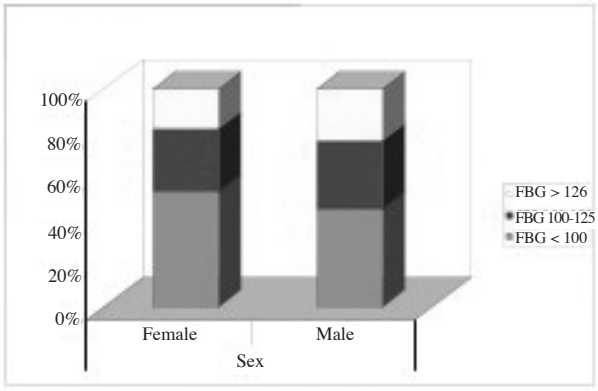

Figure 4. Distribution of FBG according to sex.

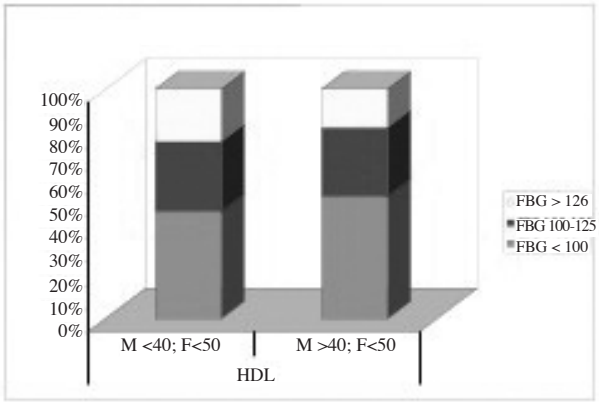

Figure 5. Distribution of FBG according to HDL.

Fasting blood glucose concentrations were shown in figure 1. 50,2 % of the patients had FBG levels less than 100 mg/dL. The prevalence of impaired FBG was detected as to be 29.6 %. On the other hand diabetes prevalence was calculated as % 20.3. In patients with FBG levels less than 100 mg/dL, had a mean value of FBG as 89,83±6,66 mg/dL; in those with FBG concentrations between 100-125 mg/dL had a mean value of FBG as 108,8±7,04 mg/dL, and finally in those with FBG more than 126 mg/dL had a mean value as 190,21±64,26 mg/dL. Mean values of FBG increased from non-diabetic patients towards diabetics ones. The ratio of patients with HbA1C < 6 and those > 7,6 were similar such as 32,6 % and 32,1 % respectively. Interestingly, 60,9 % of individuals had HbA1C values <7 (Figure 2).

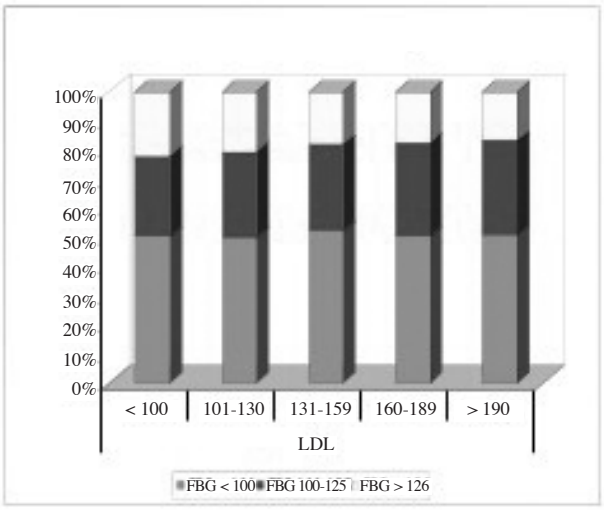

Figure 6. Distribution of FBG according to LDL.

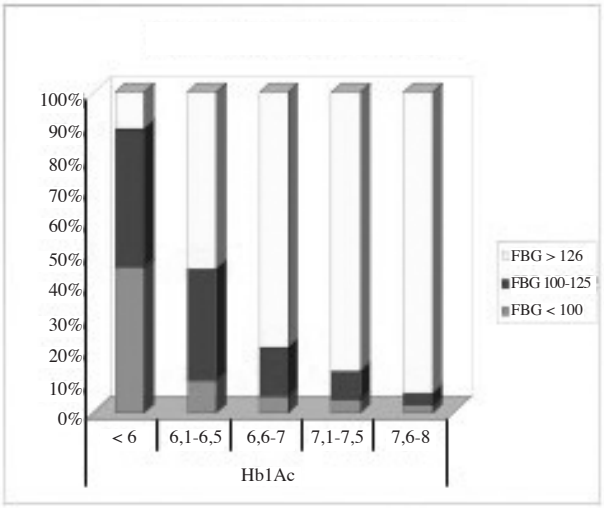

Figure 7. Distribution of FBG according to TG and total cholesterol.

Distribution of FBG according to demographic data is seen in figure 3. There is a powerful significance between age and FBG (p<0,01). When we detailed according age groups, we can see that the most significant age group is 20- 39 years, however, as age increases (specially 50->70 years) FBG significantly increases too.(p<0.001). FBG levels < 100 mg/dL are mostly seen in women and FBG levels >126 mg/dL are present in men (p<0.001). (Figure 3,4)

Distributions of FBG according to HDL, to LDL, to TG, and to total cholesterol levels respectively can be seen in Figure 5,6,7.

The distribution of HbA1C and of lipid parameters levels according FBG are shown in table 4. We detected direct correlation between FBG vs. TG and total cholesterol concentrations. (p<0.001). However there was an inverse relationship between FBG and HDL-C values. (p<0.001).

Evaluation of lipid parameters according to age is shown in table 5. There is a powerful significance between lipid parameters and age. When we detailed according to age groups we see that most significant age group is between 40-69 years. As age increases LDL,TG and total cholesterol levels increases. 36 % of patients between 50-59 years have LDL level above 190 mg/dl

There was a powerful significance between FBG and HbA1C (p<0,01). As FBG increases HbA1C increases too (Figure 8).

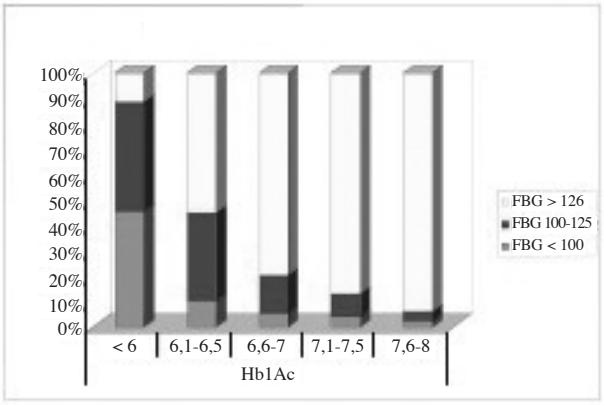

Figure 8. Distribution of FBG according to HbA1C.

Table 3. Evaluation of lipid parameters according to FBG.

		FBG			
		< 100 **n (%)**	**100-125** **n (%)**	**> 126** **n (%)**	*p
HDL	M <40; F<50	7803 (%53,9)	4947 (%57,3)	3882 (%64,5)	0,001**
	M >40; F>50	6670 (%46,1)	3679 (%42,7)	2138 (%35,5)	
LDL	< 100	4143 (%29,3)	2287 (%27,3)	1834 (%31,7)	
	101-130	4849 (%34,3)	2854 (%34,1)	2039 (%35,3)	
	131-159	3259 (%23,0)	2003 (%23,9)	1248 (%21,6)	0,001**
	160-189	1408 (%9,9)	904 (%10,8)	497 (%8,6)	
	> 190	496 (%3,5)	317 (%3,8)	166 (%2,9)	
TG	< 150	9345 (%61,2)	4439 (%49,2)	2337 (%37,8)	
	151-199	2590 (%17,0)	1847 (%20,5)	1239 (%20,0)	
	200-499	3148 (%20,6)	2566 (%28,4)	2323 (%37,5)	0,001**
	> 500	183 (%1,2)	169 (%1,9)	290 (%4,7)	
Total Cholesterol	< 200	8177 (%53,2)	4484 (%49,5)	3179 (%51,2)	
	201-239	4593 (%29,9)	2855 (%31,5)	1901 (%30,6)	0,001**
	> 240	2605 (%16,9)	1727 (%19,0)	1133 (%18,2)	
Hb1Ac	< 6	916 (%81,8)	884 (%58,4)	227 (%6,4)	
	6,1-6,5	127 (%11,2)	442 (%29,2)	694 (%19,5)	
	6,6-7	25 (%2,2)	74 (%4,9)	390 (%10,9)	0,001**
	7,1-7,5	18 (%1,6)	39 (%2,6)	382 (%10,7)	
	7,6-8	43 (%3,8)	75 (%5,0)	1870 (%52,5)	

**: Ki square test, **p<0,01*

Table 4. Evaluation of lipid parameters according to age.

		Age						
		20-29 n (%)	**30-39 n (%)**	**40-49 n (%)**	**50-59 n (%)**	**60-69 n (%)**	**> 70 n (%)**	*p
HDL	E <40; K<50	684 (%4,1)	1585 (%9,5)	3766 (%22,6)	4689 (%28,2)	3578 (%21,5)	2352 (%14,1)	0,001**
	E >40; K>50	516 (%4,1)	998 (%8,0)	2344 (%18,7)	3518 (%28,1)	3022 (%24,2)	2110 (%16,9)	
LDL	< 100	681 (%8,2)	1019 (%12,3)	1687 (%20,4)	1954 (%23,6)	1695 (%20,5)	1240 (%15,0)	
	101-130	326 (%3,3)	915 (%9,4)	2222 (%22,8)	2753 (%28,2)	2099 (%21,5)	1437 (%14,7)	
	131-159	120 (%1,8)	398 (%6,1)	1324 (%20,3)	1991 (%30,5)	1614 (%24,7)	1077 (%16,5)	0,001**
	160-189	43 (%1,5)	138 (%4,9)	515 (%18,3)	914 (%32,5)	751 (%26,7)	454 (%16,1)	
	> 190	13 (%1,3)	45 (%4,6)	166 (%16,9)	353 (%36,0)	252 (%25,7)	151 (%15,4)	
TG	< 150	1056 (%6,5)	1814 (%11,2)	3455 (%21,4)	4052 (%25,1)	3300 (%20,4)	2462 (%15,3)	
	151-199	126 (%2,2)	378 (%6,7)	1134 (%20,0)	1675 (%29,5)	1430 (%25,2)	938 (%16,5)	0,001**
	200-499	136 (%1,7)	551 (%6,8)	1656 (%20,6)	2597 (%32,2)	1967 (%24,4)	1149 (%14,3)	
	> 500	5 (%0,8)	62 (%9,7)	161 (%25,1)	221 (%34,4)	138 (%21,5)	55 (%8,6)	
Total cholesterol	< 200	1098 (%6,9)	1951 (%12,3)	3534 (%22,3)	3829 (%24,1)	3144 (%19,8)	2304 (%14,5)	
	201-239	155 (%1,7)	614 (%6,6)	1928 (%20,6)	2905 (%31,0)	2280 (%24,4)	1480 (%15,8)	0,001**
	> 240	84 (%1,5)	254 (%4,6)	981 (%17,9)	1843 (%33,7)	1456 (%26,6)	856 (%15,6)	

**: Ki square test, **p<0,01*

Table 5. Evaluation of lipid parameters according to HbA1c.

		Hb1Ac					
		< 6 n (%)	**6,1-6,5 n (%)**	**6,6-7 n (%)**	**7,1-7,5 n (%)**	**7,6-8 n (%)**	*p
HDL	E <40; K<50	1088 (%28,9)	769 (%20,4)	291 (%7,7)	306 (%8,1)	1309 (%34,8)	0,001**
	E >40; K>50	897 (%38,4)	475 (%20,3)	188 (%8,0)	131 (%5,6)	647 (%27,7)	
~~LDL~~							~~0,101~~
	< 100	595 (%31,4)	405 (%21,4)	164 (%8,7)	134 (%7,1)	594 (%31,4)	
	101-130	694 (%33,5)	410 (%19,8)	169 (%8,2)	165 (%8,0)	632 (%30,5)	
	131-159	425 (%32,8)	272 (%21,0)	94 (%7,3)	84 (%6,5)	419 (%32,4)	
	160-189	171 (%34,9)	86 (%17,6)	32 (%6,5)	23 (%4,7)	178 (%36,3)	
TG	> 190	46 (%30,3)	28 (%18,4)	9 (%5,9)	11 (%7,2)	58 (%38,2)	0,001**
	< 150	1148 (%40,5)	569 (%20,1)	203 (%7,2)	176 (%6,2)	740 (%26,1)	
	151-199	357 (%30,2)	253 (%21,4)	119(%10,1)	97 (%8,2)	358 (%30,2)	
Total cholesterol	200-499	491 (%24,9)	416 (%21,1)	157 (%8,0)	149 (%7,6)	756 (%38,4)	0,001**
	> 500	27 (%12,8)	26 (%12,3)	9 (%4,3)	17 (%8,1)	132 (%62,6)	
	< 200	1095 (%33,1)	695 (%21,0)	278 (%8,4)	256 (%7,7)	982 (%29,7)	
	201-239	636 (%33,8)	392 (%20,9)	151 (%8,0)	122 (%6,5)	579 (%30,8)	
	> 240	297 (%29,0)	178 (%17,4)	61 (%6,0)	59 (%5,8)	429 (%41,9)	

**: Ki square test, **p<0,01*

We detected powerful significance between HbA1c vs. HDL, TG, and total cholesterol (p<0.001).

The percentage of patients with low HbA1c (<6) and who had low HDL concentration too, was 28.9 %. On the other hand, patients with bad glycemic control (HbA1C: 7,6-8) and who had low HDL levels were 34,8 %. As HbA1c levels increase, HDL concentrations decrease.

While HbA1c levels were increasing, TG levels were increasing too. In the patient group with low HbA1c value, we remarked that there was 12,8 % of patients with TG > 500 mg/dL. Whereas in patients with poor glycemic control this ratio augmented to 62,6 %.

DISCUSSION

Diabetes Mellitus is an important health problem

with increasing prevalence. There are drastic differences of type 2 DM distribution in different countries. In the study of Zimmet et al., diabetes prevalence were depicted as 1-2 % in Tanzania, Bantu region, China, and as 40-50 % in Pima, Nauri and Micronesia [1,12]. In a national screening done in Iran, diabetes prevalence was found out as 7,7 % in individuals between 25-64 years, which means 2,2 million adults and the prevalence of impaired fasting glucose was detected as 16,8 % individuals meaning 4,4 million people [4,13]. In Turkey, a screening was performed at 1997-1998, by Turkish diabetic epidemiology trial group (TURDEP). They observed that diabetes prevalence at 20-80 years was 7.2 %, whereas impaired glucose tolerance prevalence was 6.7 %. In our study, results were quite different from the study performed 10 years ago by TURDEP. The ratio of individuals with FBG<100 mg/dL was 50.2 %, between 100-125 mg/dL 29.6 % and with FBG>126 mg/dL 20.3 % respectively; which means an increasing prevalence.This difference in prevalence could be explained through genetics, social risk factors (such as diet,obesity,physical inactivity and so forth) and special conditions (such as intrauterine growth) as mentined by [13,14]. In the future, with increasing urbanization, population, age distribution, and alimentary habits, increased DM prevalence is expected.

DM is an independent risk for cardiovascular disease, and this risk is more prominent when there is concomitant dyslipidemia. In the Multiple Risk Factor Intervention (MRFIT) trial, it is claimed that in diabetics mortality caused by cardiovascular events is 4 times more than non diabetics even though cholesterol levels were similar in both [15]. In the study performed by Khan et al with 1011 diabetic patients, there were higher levels of cholesterol, TG and lower levels of HDL-C in patients with poor glycemic control compared with those with better ones. More a linear relation was found between levels of HbA1c and dyslipidemia [16]. Similar findings were reported in our study too. In other investigation such as Strong Heart Study, HDL-C levels in diabetic male and female patients were measured lower than those in non-diabetics. This difference was more predominant in diabetic females, and this can explain why cardiovascular risk is more important in diabetic women [17]. In our study, HDL concentrations were inversely proportional with FBG levels. Overall the population HDL level was found 45,71±12,87. Mahley et al claimed in their study that in Turkey HDL was low [18]. Our results indicate room for further research to increase our confidence in this matter.

Treatment of dyslipidemia and concomitant risk factors ameliorate the prognosis of cardiovascular events in type 2 diabetic patients. Both ADA and AHA pointed out low LDL levels as the target for antilipidemic treatment [19]. Multiple double blind controlled studies had proved that lowering LDL-C levels with statins decreases cardiovascular disease risk in diabetics. In more than 30 meta-analyses of these researches, had shown that 1 % decrease of total cholesterol will decrease mortality risk be 1 % too. Statins are first line drugs to be chosen for dyslipidemia treatment [20]. In the Heart Protection Study, 5963 patients were included, in diabetic subgroup 40 mg/day simvastatin was administered for 5 years. At the end of the trial results pointed out decrease of MI frequency by 37 %, and cardiovascular mortality by 20 %. On the other hand, in patients with high risk, lowering LDL-C levels by a ratio of 20-30 % lead to a decrease of cardiovascular risk by 30 % [21].

Lipid abnormalities caused directly by diabetes are named as diabetic dyslipidemia and this condition fastens atherosclerosis process. Every year and sometimes more often, lipid parameters should be measured in every adult patients. Every diabetic patient should lessen saturated lipid and cholesterol intake, should increase fibrous diet, should give up smoking, and should increase physical activity. Life style changes will lead to a better lipid profile in diabetics. In diabetic patients aged >40 years, with one or more cardiovascular risk, lipid lowering therapy should decrease LDL by 30-40 % and

had a goal of LDL <100 mg/dL [22]. Even though LDL concentrations are lessened, cardiovascular disease risk decrease relatively only by 1/3. In order to cover the other 2/3 part, new treatment regimen apart of LDL focused therapies, should be designed.

CONCLUSIONS

In our study, 30745 patients whom 67.1 % were female and 32.9 % males, were screened. Among the patients 27.9 % were aged between 50-59 years.

• In patients with FBG< 100 mg/dL had a mean value of 89.83; in those with FBG between 100-125 mg/dL had a mean value of 108.8 mg/dL and in those with FBG> 126 mg/dL had a mean value of 190.21 mg/dL.

• Mean HDL level was measured as 45.71 mg/dL, it was inversely proportional to FBG (p<0.001).

• Mean LDL value was 120.03 mg/dL. In 29.2 % of patients LDL was < 100 mg/dL.

• LDL,TG and total cholesterol levels increase as age increases.According to age groups the most significant range was between 40-69 years.

• 36 % of patients between 50-59 years have LDL levels above 190 mg/dl.

• Mean value of total cholesterol was 200.70 mg/dL; 51,7% of all patients had a level <200 mg/dL (p<0.001).

• 52,9 % of cases had a value of TG<150 mg/dL. FBG and TG concentrations were proportional to one another (p<0.001).

• 50,2 % of cases had a FBG level < 100 mg/dL. According age groups, the most significant range was between 20-39 years but as ages increases (specially 50->70 years) FBG levels were dramatically and significantly increasing (p<0.001). FBG<100 mg/dl were mostly seen in women, whereas FBG levels> 126 mg/dL were mostly present in men (p<0.01).

• Interestingly, we found out similar ratio in patients with HbA1c < 6 and in those with > 7.6, respectively as 32.6 % and 32.1 %. More, the ratio of patients with HbA1C< 7 were calculated as 60.9 %. These results are in concordance with FBG data. As HbA1c level increases, HDL level inversely decreases (p<0.01).

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