RESULTS

The study was conducted on forty type 2 diabetic patients. They were divided into group I that comprised of twenty patients with ischemic heart disease; and group II of twenty patients without ischemic heart disease. Group I was further subdivided into group IA consisted of ten patients with ischemic ECG changes but without myocardial infarction; and group IB of ten patients who had infarction.

The results of this work were as follows:

Age (Table 9) (chart 1)

Group IA patients were found to have age range of 43-83 years with a mean of 57 ± 11.1 years, while group IB patients had age range of 41-74 years with a mean of 56.9 ± 8.8 years. Group II patients had age ranging between 39 and 75 years with a mean of 55 ± 10.1 years.

On comparison, there was no statistically significant difference between age of patients of the studied groups.

Smoking (Table 10) (chart 2)

Statistical analysis of the number of smokers in different groups showed that the percentage of smokers was higher in group IB (70%) in relation to the other groups (30% for IA and 40% for II), but this was without statistical significance.

Hypertension (Table 11) (chart 3)

There was no statistically significant difference between the percentage of hypertensives in the different groups (50%, 70% and 45% for groups IA, IB and II respectively).

Body mass index (BMI)

Table (12) reported significant difference between the BMI of patients of group IA (33.6 ± 8.4) and that of the other groups (27.8 ± 3.5 for group IB and 28.7 ± 3.6 for group II). (chart 4)

Table (13) showed a highly significant positive correlation between BMI and glycosylated Hb (Hb A_{1c}).

Lipid profile:

Table (14) and chart (5) that compared between the studied groups regarding lipid profile, reported non significant difference between them. For serum cholesterol level, it was 235 ± 54.2; 203.2 ± 31.1 and 211.9 ± 50.6 mg/dl for groups IA; IB and II respectively.

For serum triglyceride level, it was 159.8 ± 56.9; 141.2 ± 44.5 and 136.9 ± 45.9 mg/dl for groups IA, IB and II respectively.

For low density lipoprotein level (LDL), it was 123.4 ± 30.9; 105.7 ± 12.9 and 111.5 ± 29.7 mg/dl for groups IA, IB and II respectively.

For high density lipoprotein level (HDL), it was 38.2 ± 6.4; 40.3 ± 5.9 and 42.7 ± 5.8 mg/dl for groups IA, IB and II respectively.

Table (15) and chart (6) compared between groups I & II only regarding lipid profile, and it concluded that the mean value of different lipid parameters is higher in the ischemic group I than in the non-ischemic group II (except for HDL level) but without statistical significance.

For serum cholesterol level, it was 219 ± 46.1 mg/dl for group I and 211.9 ± 50.6 mg/dl for group II.

For serum triglyceride level, it was 150.5 ± 50.6 mg/dl for group I and 136.9 ± 45.9 mg/dl for group II.

For serum LDL level, it was 114.6 ± 24.8 mg/dl for group I and 111.5 ± 29.7 mg/dl for group II.

Table (16) and chart (7) that compared between the patients of different Apo E genotypes regarding lipid profile, reported different results.

For serum cholesterol, the mean value was as follows: 181.3 ± 7.9; 216 ± 50.2 and 233.4 ± 48.3 mg/dl for Apo E2; Apo E3 and Apo E4 genotypes patients respectively. On comparison; there was highly significant difference between Apo E2 and Apo E3 genotypes patients and also between Apo E2 and Apo E4 genotypes patients. On the other hand; there was no significant difference between Apo E3 and Apo E4 genotypes patients.

For serum triglyceride level, the mean value was higher in Apo E2 (155.3 ± 5.2) and Apo E4 (157.7 ± 53.4) in comparison to Apo E3 (134 ± 50.7) genotypes patients. On comparison; there was no statistically significant difference.

For LDL level, Apo E4 genotype patients reported the highest level (130 ± 25.4) followed by Apo E3 genotype patients (110.3 ± 26.9), the level of LDL in Apo E2 genotype patients was the lowest level (92.2 ± 3.9). On comparison; there was significant difference between Apo E2 and Apo E3 genotypes patients and also between Apo E3 and E4

genotypes patients, while the statistical difference between Apo E2 Apo E4 genotypes patients was highly significant.

For HDL level, Apo E3 genotype patients reported higher level in comparison to Apo E2 and Apo E4 genotypes patients (38.8 ± 3.2; 42.2 ± 6.3 and 39.7 ± 6.7 for Apo E2; Apo E3 and Apo E4 genotypes patients respectively). On comparison; there was no significant difference between these figures.

Table (17) that studied the correlation between lipid profile and glycosylated Hb (HbA_{1c}), demonstrated highly significant positive correlation between serum cholesterol level and HbA_{1c}, between serum triglycerides level and HbA_{1c}, and also between serum HDL level and HBA_{1c}. Between serum LDL level and HBA_{1c}; there was a significant positive correlation.

Glycemic control (Table 18) (chart 8):

Statistical analysis of glycemic control (represented by HbA_{1c}) in different studied groups revealed that the mean value of HbA_{1c} was highest in group IA (9.9 ± 2.1); followed by group II (9.2 ± 1.2) and lastly group IB (8.3 ± 1.7), but this was without statistical significance.

CAD risk factors:

As regards the relationship between apo E polymorphism and different CAD risk factors; our study did not observe any significant relation ship between these risk factors and apo E genotype.

For smoking; the percentage of smokers was 33.33%.,50% and 41.66% among the patients with apo E2 and apo E4 genotypes

respectively, and the differences between theses figures were without statistical significance (p> 0.05). (Table 19) (chart 9)

For hypertension; the percentage of hypertensives was 50% ,63.63% and 66.66% for apo E2 , apo E3 and apo E4 patients respectively, and also the differences between these figures did not yield statistical significance (p>0.05). (Table20) (chart 10)

For BMI; there was non significant difference between the BMI of different apo E genotypes patients (28.7±0.28 , 29.32 ± 4.9 and 29.92 ± 7.71 for apo E2, apo E3 and apo E4 genotypes respectively) (p>0.05). (Table21) (chart 11)

Also the differences between HbA1c of different apo E genotypes patients were without statistical significance (9.37 ± 1.7, 9.18 ± 1.6 and 8.96 ± 1.9 for apo E2, apo E3 and apo E4 genotypes respectively)(p>0.05). (Table22) (chart 12)

Ischemic heart disease (IHD):

Table (23) and chart (13) compared between the patients of IHD regarding the Apo E genotype.

There was 1 patient with IHD from 6 patients with Apo E2 genotype (with a percentage of 66.66%), while there was 9 patients with IHD from 22 patients with Apo E3 (with a percentage of 40.91%). The 12 patients who presented é Apo E4 genotype; contained 10 patients with IHD (with a percentage of 83.33%).

On comparison; there was significant difference between Apo E2 and Apo E4 genotypes patients (Z3 1.71), on the other hand the

difference between Apo E2 and Apo E3 and also between Apo E3 and Apo E4 genotypes didn't reach statistical significance (Z1 0.88, Z2 1.58).

Table (24) and chart (14) compared between the different studied groups regarding distribution of Apo E genotypes.

There was 6 patients with Apo E2 genotype, one patient belonging to group IA (With a percentage of 16.66%); while the other 5 patients belonging to group II (with a percentage of 83.33%). On comparison; there was highly significant ($P < 0.001$) difference between IA & II groups, and significant difference ($P < 0.05$) between IB & II groups. On the other hand; the difference between IA & IB groups was insignificant ($P > 0.05$).

Apo E3 genotype included 22 patients, 4 patients were belonging to group IA (18.18%), 5 patients were belonging to group IB (22.72%), and 13 patients were belonging to group II (50.09%). On comparison; the difference between groups IA & II and between IB & II was significant ($P < 0.05$), while it was insignificant between IA&IB groups ($p > 0.05$).

Apo E4 genotype contained 12 patients, 6 patients were within group IA (50%), 4 patients were within group IB (33.33%), and 2 patients were within group II (16.66%). On comparison; the difference between these groups was insignificant ($P >0.05$).

Table (9): Comparison between the studies groups regarding age

Age / Studied groups	Mean value ± S.D	Test of significance	
		t	P
Group IA (n= 10)	57 ± 11.1	t_1(IAVsII)=0.48	> 0.05 (N.S)
Group IB (n= 10)	56.9 ± 8.8	t_2(IBVsII)=0.53	> 0.05 (N.S)
Group II (n= 10)	55 ± 10.1	t_3(IAVsIB)=0.02	> 0.05 (N.S)
		F=0.19	P > 0.05 (N.S)

Table (10): Comparison between the studied groups regarding smoking.

smoking / Studied groups	Number (%) of smokers	Test of significance	
		Z	P
Group IA (n= 10)	3 (30%)	Z1(IAVsII)= 0.43	> 0.05(N.S)
Group IB (n= 10)	7 (70%)	Z2(IBVsII)= 1.1	> 0.05 (N.S)
Group II (n= 20)	8 (40%)	Z3(IAVsIB)= 1.26	>0.05 (N.S)

Table (11): Comparison between the studied groups regarding hypertension.

Hypertension / Studied groups	Number (%) of hypertensives	Test of significance	
		Z	P
Group IA (n= 10)	5 (50%)	Z1 (IA Vs II)= 0.19	> 0.05(N.S)
Group IB (n= 10)	7 (70%)	Z2 (IB Vs II)= 0.88	> 0.05 (N.S)
Group II (n= 20)	9 (45%)	Z3 (IA Vs IB)= 0.58	>0.05 (N.S)

Table (12): Comparison between the studied groups regarding body mass index (BMI).

BMI / **studied groups**	**Mean value** ± S.D	**Test of significance**	
		t	**P**
Group IA (n= 10)	33.6 ± 8.4	t_1 (IA Vs II)= 1.77	< 0.05 (signifiant)
Group IB (n= 10)	27.8 ± 3.5	t_2 (IB Vs II)= 0.66	> 0.05 (N.S)
Group II (n= 20)	28.7 ± 3.6	t_3 (IA Vs IB)= 2.02	< 0.05 (signifiant)
		F= 1.74	P> 0.05 (N.S)

Table (13): Correlation between body mass index (BMI) and Glycosylated Hb (Hb A1c).

BMI	Correlation coefficient "r"	P
Hb A_{1c}	0.543	< 0.01 (H.S)

Table (14): Comparison between the studied groups regarding lipid profile.

Studied groups / Lipid profile	Group IA (n=10)	Group IB (n=10)	Group II (n=20)	Test of significance	
				F	p
*** Cholesterol**	235.6 ± 54.2	203.2 ± 31.1	211.9 ±50.6	1.28	> 0.05 (N.S)
	t_1 (IA V5 II)= 1.16	t_2 (IB Vs II)= 0.58	t_3 (IA Vs IB)= 1.64		
	P > 0.05 (N.S)	P > 0.05 (N.S)	P > 0.05 (N.S)		
*** Triglycerides**	159.8 ± 56.9	141.2 ± 44.5	136.9 ± 45.9	0.76	> 0.05 (N.S)
	t_1 (IA Vs II)= 1.1	t_2 (IB Vs II)= 0.24	t_3 (IA Vs IB)= 0.81		
	P > 0.05 (N.S)	P > 0.05 (N.S)	P > 0.05 (N.S)		
*** LDL**	123.4 ± 30.9	105.7 ± 12.9	111.5 ± 29.7	1.14	> 0.05 (N.S)
	t_1 (IA Vs II)= 1.01	t_2 (IB Vs II)= 0.74	t_3 (IA Vs IB)= 1.67		
	P > 0.05 (N.S)	P > 0.05 (N.S)	P > 0.05 (N.S)		
*** HDL**	38.2 ± 6.4	40.3 ± 5.9	42.7 ± 5.8	1.91	> 0.05 (N.S)
	t_1 (IA Vs II)= 1.85	t_2 (IB Vs II)= 1.03	t_3 (IA Vs IB)= 0.76		
	P > 0.05 (N.S)	P > 0.05 (N.S)	P > 0.05 (N.S)		

Table (15): Comparison between the studied groups regarding lipid profile.

Studied groups / Lipid profile	Group I (n=20)	Group II (n=20)	Test of significance	
			t	p
* Cholesterol	219 ± 46.1	211.9 ± 50.6	0.49	> 0.05 (N.S)
* Triglycerides	150.5 ± 50.6	136.9 ± 45.9	0.89	> 0.05 (N.S)
* LDL	114.6 ± 24.8	111.5 ± 29.7	0.35	> 0.05 (N.S)
* HDL	39.3 ± 6.1	42.7 ± 5.8	1.8	> 0.05 (N.S)

Table (16): Comparison between different Apo E genotypes regarding lipid profile.

ApoE genotype / Lipid profile	2 (n=6)	3 (n=22)	4 (n=12)	Test of significance	
				F	p
* Cholesterol	181.3 ± 7.9	216.1 ± 50.2	233.4 ± 48.3	2.46	> 0.05 (N.S)
	t_1(2Vs 3)= 3.17	t_2(3Vs 4)= 0.96	t_3(2 Vs 4)= 3.49		
	P < 0.01 (H.S)	P > 0.05 (N.S)	P < 0.01 (H.S)		
*Triglycerides	155.3 ± 5.2	134 ± 50.7	157.7 ± 53.4	1.11	> 0.05 (N.S)
	t_1(2Vs 3)= 1.98	t_2(3Vs 4)= 1.22	t_3(2 Vs 4)= 0.15		
	P > 0.05 (N.S)	P > 0.05 (N.S)	P > 0.05 (N.S)		
* LDL	92.2 ± 3.9	110.3 ± 26.9	130 ± 25.4	4.88	< 0.01 (H.S)
	t_1 (2 Vs 3)= 2.6	t_2(3Vs 4)= 2.07	t_3(2 Vs 4)= 3.11		
	P < 0.05 (significant)	P < 0.05 (significant)	P < 0.01 (H.S)		
* HDL	38.8 ± 3.2	42.2 ± 6.3	39.7 ± 6.7	1.1	> 0.05 (N.S)
	t_1(2Vs 3)= 1.81	t_2(3Vs 4)= 1.09	t_3(2 Vs 4)= 0.36		
	P > 0.05 (N.S)	P > 0.05 (N.S)	P > 0.05 (N.S)		

Table (17): Correlation between glycosylated Hb (Hb A1c) and lipid profile.

Hb A_{1c}	**Correlation coefficient "r"**	**P**
* Cholesterol	0.4602	< 0.01 (H.S)
* Triglycerides	0.546	< 0.01 (H.S)
* LDL	0.2902	< 0.05 (signifacnt)
* HDL	0.5159	< 0.01 (H.S)

Table (18): Comparison between the studied groups regarding Glycosylated Hb (Hb A1c).

Hb A_{1c} / **Studied groups**	**Mean value ± S.D**	**Test of significance**	
		T	**P**
Group IA (n= 10)	9.9 ± 2.1	t_1 (IA Vs II)= 0.99	> 0.05 (N.S)
Group IB (n=10)	8.3 ± 1.7	t_2 (IB Vs II)= 1.49	> 0.05 (N.S)
Group II (n=20)	9.2 ± 1.2	t_3(IA Vs IB)= 1.87	> 0.05 (N.S)
		F= 2.59	P > 0.05 (N.S)

Table (19): comparison between different apo E groups regarding smoking

Smoking / Apo E genotype	Number (%) of smokers	Test of significance	
		Z	P
2(N= 6)	2 (33.33%)	Z1(2VS3) = 0.53	> 0.05 (N.S)
3(N=22)	11 (50%)	Z2(3VS 4) = 0.34	>0.05 (N.S)
4 (N= 12)	5 (41.66%)	Z3(2VS 4)= 0.27	>0.05(N.S)

Table (20) :comparison between different Apo E groups regarding hypertension

Hypertension / Apo e genotype	Number (%) of hypertensives	Test of significance	
		Z	P
2 (n=6)	3 (50%)	Z1(2 vs 3)= 0.38	> 0.05 (N.S)
3 (n= 22)	14 (63.63%)	Z2 (3 vs 4)= 0.1	> 0.05(N.S)
4 (n=12)	8 (66.66%)	Z3 (2 vs 4)= 0.43	> 0.05(N.S)

Table (21): comparison between different apoE groups regarding BMI

BMI / Apo E genotype	Mean value ± S.D	Test of significance	
		t	P
2 (N=6)	28.67± 0.28	t1 (2VS3)= 0.62	>0.05 (N.S)
3 (N=22)	29.32±4.9	t2 (3VS 4)=0.24	> 0.05 (N.S)
4 (N=12)	29.92±7.71	t3(2VS 4)= 0.56	> 0.05(N.S)
		F 0.104	P> 0.05(N.S)

Table (22) : comparison between different apo E groups regarding Glycosylated Hb (HBA1c)

$HB\ A_{1c}$ / Apo E genotype	Mean value ± S.D	Test of significance	
		t	P
2 (N=6)	9.37 ±1.7	t1 (2 VS 3) = 0.24	>0.05(N.S)
3 (N=22)	9.18 ±1.6	t2 (3 VS 4) = 0.35	> 0.05(N.S)
4 (N=12)	9.18 ±1.9	t3 (2 VS 4) =0.46	> 0.05(N.S)
		F 0.13	P>0.05(N.S)

Table (23): Comparison between different Apo E groups regarding ischemic heart disease (IHD).

IHD / ApoE genotype	Number (%) of patients with IHD	Test of significance	
		Z	P
2 (n= 6)	1 (16.66%)	Z_1 (2 v_5 3)= 0.88	> 0.05 (N.S)
3 (n= 22)	9 (40.91%)	Z_2 (3 v_5 4)= 1.58	> 0.05 (N.S)
4 (n= 12)	10 (83.33%)	Z_3 (2 v_5 4)= 1.71	< 0.05 (signifiant)

Table (24): Comparison between the different studied groups regarding distribution of Apo E genotypes.

Studied groups / Apo E genotypes	Number (%) of patients			Test of Significance	
	IA	IB	II	Z	P
2 (n = 6)	0	1 (16.66%)	5 (83.33%)	Z1 (IA VS II)= 5.48 Z2 (IB VS II)= 1.63 Z3 (IA Vs IB)= 1.1	< 0.001 (H.S) < 0.05 (Significant) > 0.05 (N.S)
3 (n = 22)	4 (18.18%	5 (22.72%)	13 (50.09%)	Z1 (IA VS II)= 2.18 Z2 (IB VS II)= 1.89 Z3 (IA VS IB)= 0.33	< 0.05 (Significant) < 0.05 (Significant) > 0.05 (N.S)
4 (n = 12)	6 (50%)	4 (33.33%)	2 (16.66%)	Z1 (IA VS II)= 1.41 Z2 (IB VS II)= 0.82 Z3 (IA VS IB)= 0.63	> 0.05 (N.S) > 0.05 (N.S) > 0.05 (N.S)

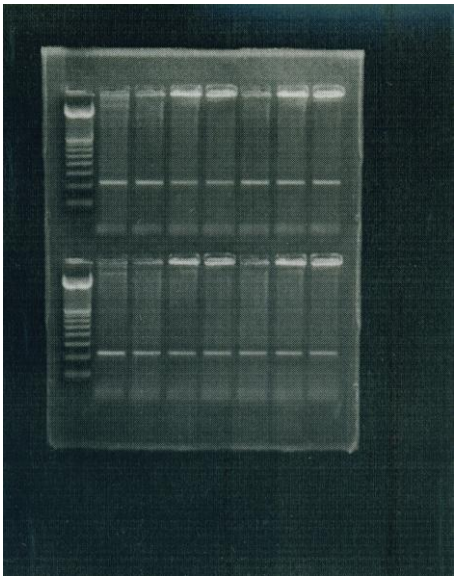

Figure (8): PCR of Apolipoprotein E Polymorphism.

The figure shows the 8 lanes of PCR for 14 cases.

The DNA marker= at 100 – 200 – 300 – 400 – 500 – 600 – 700.

The product is at= 218 bp, all cases are positive for 218 bp.

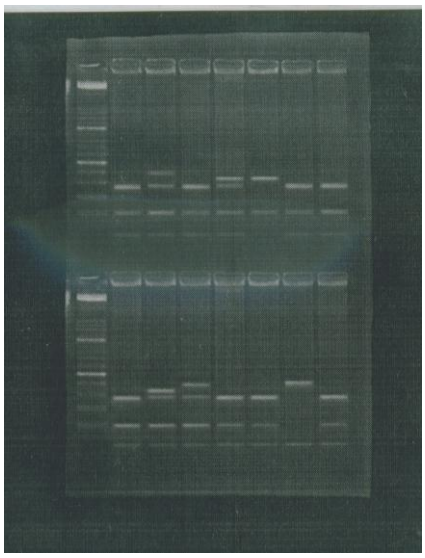

Figure (9): PCR of Apolipoprotein E polymorphism (restriction enzyme Hae II& AF III).

The figure shows the 8 lanes of PCR for 14 of our cases on two panels.

The DNA marker: at 50 – 100 – 150 – 200 – 250 – 500 – 750

E2 at 23,50,168 E3 at 23,50,145 E4 at 23,50,195

Panel	Lane No.	Result	Lane No.	Result
Panel a	1	23,50,145	6	23,50,145
	2	23,50,145,195	7	23,50,145
	3	23,50,145		
	4	23,50,145,168		
	5	50,168		
Panel b	1	23,50,145	6	23,195
	2	23,50,145,168	7	23,50,145
	3	23,50,145,195		
	4	23,50,145		
	5	23,50,145		

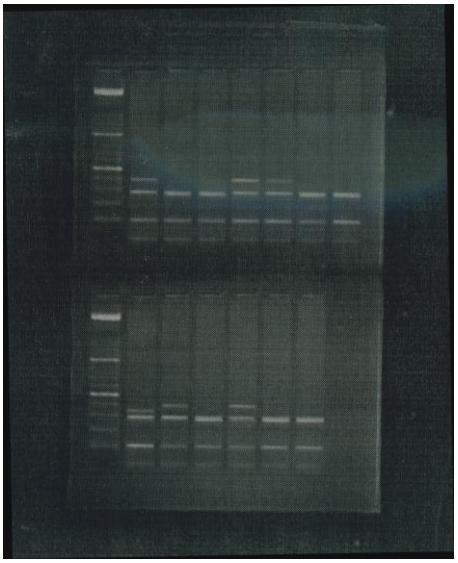

Figure (10): PCR of Apolipoprotein E polymorphism (restriction enzyme Hae II& AF III).

Panel	Lane No.	Result	Lane No.	Result
Panel a	1	23,50,145,195	6	23,50,145
	2	23,50,145	7	23,50,145
	3	23,50,145		
	4	23,50,145,195		
	5	23,50,145,195		
Panel b	1	23,50,145,168	6	23,50,145
	2	23,50,145,195		
	3	23,50,145		
	4	23,50,145,195		
	5	23,50,145		

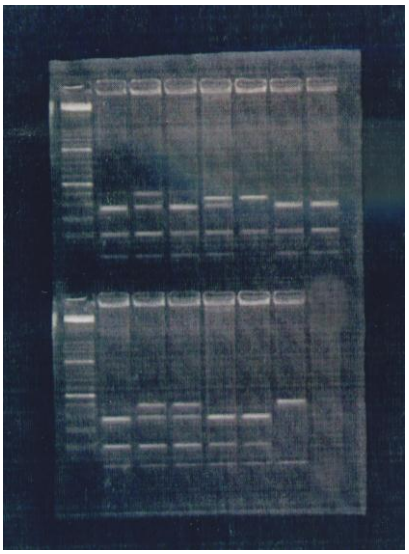

Figure (11): PCR of Apolipoprotein E polymorphism (restriction enzyme Hae II& AF III).

Panel	Lane No.	Result	Lane No.	Result
Panel a	1	23,50,145	6	23,50,145
	2	23,50,145,195	7	23,50,145
	3	23,50,145		
	4	23,50,145,168		
	5	50,168		
Panel b	1	23,50,145	6	23,195
	2	23,50,145,195		
	3	23,50,145,195		
	4	23,50,145		
	5	23,50,145		