Comparison of fasting and postprandial lipid profile among patients of IHD and healthy individuals

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Abstract

Aim and objective: To compare fasting and post prandial lipid profile among patients of IHD and healthy individuals. **Methodology:** This study was conducted to assess, correlate and determine the average differential variation of the fasting and postprandial lipid profile pattern in patients of Ischemic Heart Disease (IHD) in patients of tertiary care hospital from January 2015 to June 2016. The required data for the study was collected by using predesigned and pretested proforma. The information collected consisted of general epidemiological data, history of present illness, significant past and family history and physical examination findings. **Result and Discussion:** In our study Fasting levels of triglycerides(170.65 mg/dl), serum VLDL(33.80 mg/dl) and total cholesterol(188.50 mg/dl) in patients of IHD was significantly higher as compared to those in controls (120.59 mg/dl, 23.81 mg/dl,168.87 mg/dl respectively) difference between them was statistically significant ($p < 0.001$). Fasting serum HDL in IHD patients (42.02 mg/dl) was slightly more as compared to that in controls (41.82 mg/dl) but statistically not significant.
Key Words: Ischemic heart disease, lipid profile.

INTRODUCTION

Ischemic heart disease (IHD) is a condition in which there is an inadequate supply of blood and oxygen to a portion of the myocardium; it typically occurs when there is an imbalance between myocardial oxygen supply and demand.1 The most common cause of myocardial ischemia is atherosclerotic disease of an epicardial coronary artery or arteries sufficient to cause a regional reduction in myocardial blood flow and inadequate perfusion of the myocardium supplied by the involved coronary artery.[1] Genetic factors, a high-fat and energy-rich diet, smoking and a sedentary lifestyle are associated with the emergence of IHD. Obesity, insulin resistance and type 2 diabetes mellitus (DM) are increasing and are powerful risk factors for IHD. In light of the projection of large increases in IHD throughout the world, IHD is likely to become the most common cause of death worldwide by 2020. Coronary heart disease (CHD syn: ischemic heart disease)is the cause of 25-30 per cent of deaths in most industrialized countries. It is a multifactorial disease where atherosclerosis and dyslipidaemia are the prominent causes involved. Hypercholesterolaemia and hypertriglyceridaemia are considered the independent risk factors. The study of lipid profile is of primary importance due to its role in development of atherosclerotic changes in IHD.. In view of this present study was aimed to assess the lipid profile fasting and postprandial pattern in ischemic heart disease patients.

MATERIAL AND METHODS

Study was carried out in patients of tertiary care hospital from January 2015 to June 2016.Study population consisted of two groups. First group consisted of 150 healthy individuals without IHD and risk factors for IHD and were considered as controls, second group consisted of 150 patients diagnosed as having IHD. Both the groups are matched with various variables like age, sex, locality and literacy.

Inclusion Criteria

1. The patients with age >30 yrs in Tertiary Care Centre and Diagnosed as Ischemic Heart Disease based on history, physical examination and investigations.
2. The healthy controls with age > 30 yrs matched with the patients on various variables without IHD and risk factors for IHD.

Exclusion Criteria

1. Unstable patients of Ischemic Heart Disease, with deranged vital parameters like altered sensorium, fever, tachycardia or bradycardia, hypotension (systolic BP≤ 90mmhg).
2. Patients having terminal illness or haemodynamicaly unstable, hypotension (systolic BP≤ 90mmhg), on ventilatory support.
3. Patients having peripheral vascular disease, cardiomyopathies, congenital heart disease and rheumatic heart disease. 4) The patients/healthy controls not willing to participate in the study.

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4. Patients and healthy individuals < 30 yrs of age. The study was approved by the Institutional Ethics Committee. Written informed consent of patients was taken. The required data for the study was collected by using predesigned and pretested proforma. The information collected consisted of general epidemiological data, history of present illness, significant past and family history and physical examination findings. To confirm the diagnosis of ischemic heart disease we have performed ECG of each patients and and 2-D Echo of selected patients. Venous blood sample was collected after an overnight fast of 8 to 12 hours and 2hours postprandial for estimation of blood cholesterol, triglyceride, high density lipoprotein (HDL) cholesterol, low density lipoprotein (LDL) cholesterol, very low density lipoprotein (VLDL) cholesterol in both patients as well as in controls. Patients and controls were also evaluated with routine haemogram and biochemical studies like random blood sugar level, liver function test, kidney function test and electrocardiogram.

RESULTS

Out of 150 patients 87 (58%) were males and 63 (42%) were females in each group. In our study IHD was found more in males.

Table 1: Gender and lipid profile in IHD cases

Gender		TC		TG		HDL		LDL		VLDL	
		F	PP	F	PP	PP	F	PP	F	PP	F
Male	Mean	187.36	176.55	173.33	238.19	42.50	38.11	110.58	91.05	34.25	47.21
	SD	19.83	20.24	53.42	66.88	3.92	3.40	21.67	22.31	10.70	13.27
	P	p<0.001 HS		p<0.001 HS		p<0.05, S		p<0.001, HS		p<0.05, S	
Female	Mean	190.06	178.2	166.95	236.22	41.77	37.82	115.12	93.44	33.17	46.93
	SD	22.02	22.27	50.19	72.23	4.29	4.06	19.30	21.84	10.12	14.46
	P	p<0.001		HS p<0.001		HS p<0.001,		HS p<0.001		HS p<0.001, HS	

Table 1 shows, In IHD cases fall in TC, HDL, LDL and rise in TG, VLDL from fasting to postprandial was statistically significant when compared to controls in both males and females. Our study included healthy controls 6.7% between 31-40 yrs, 24% between 41-50 yrs, 33.3% between 51-60 yrs, 23.3% between 61-70 yrs and 12.7% above 70 yrs. Our study included IHD cases 3.3% between 31-40 yrs, 24.7% between 41-50 yrs, 33.3% between 51-60 yrs, 29.3% between 61-70 yrs and 9.3% above70 yrs. Majority patients belong to 51-70 yrs age group (62.6%). Range for age is 37-84yrs. Mean age of cases was 57.28± 7.56 yrs. Mean age of control was 57.06 ± 7.55 yrs. In our study IHD was found to be more in 51- 70 yrs of age.

Table 2: Age and lipid profile in Healthy individuals

Age in years		TC		TG		HDL		LDL		VLDL	
		F	PP	F	PP	F	PP	F	PP	F	PP
31-40	Mean	168.00	165.40	130.00	147.00	40.00	37.80	102.20	98.60	25.80	29.00
	SD	9.49	9.10	9.59	6.75	2.55	2.28	7.60	7.44	1.64	1.41
	P	p<0.05, S		p<0.05, S		p<0.05, S		p<0.05, S		p<0.05, S	
41-50	Mean	170.70	168.27	121.35	139.16	42.00	40.19	104.65	100.84	24.05	27.38
	SD	16.34	16.38	18.69	18.07	3.20	3.13	12.92	12.93	3.77	3.57
	P	p<0.05, S		p<0.05, S		p<0.05, S		p<0.05, S		p<0.05, S	
51-60	Mean	168.48	166.04	121.50	139.02	41.70	39.80	102.96	99.02	24.00	27.49
	SD	18.75	18.54	22.00	21.67	3.27	3.26	15.38	15.22	4.42	4.25

(Continuation of Table 2)

Age		TC F	TC PP	TG F	TG PP	HDL F	HDL PP	LDL F	LDL PP	VLDL F	VLDL PP
	P	p<0.05, S		p<0.05, S		p<0.05, S		p<0.05, S		p<0.05, S	
61-70	Mean	169.55	167.07	118.64	136.61	42.39	40.59	103.82	99.68	23.36	26.91
	SD	15.52	15.64	18.46	18.29	2.80	2.90	11.89	12.14	3.69	3.56
	P	p<0.05, S		p<0.05, S		p<0.05, S		p<0.05, S		p<0.05, S	
70 and Above	Mean	163.64	160.29	118.14	136.07	40.64	39.00	99.79	95.21	23.21	26.29
	SD	14.73	13.33	19.36	18.85	2.82	2.91	11.23	11.44	3.81	3.17
	P	p<0.05, S		p<0.05, S		p<0.05, S		p<0.05, S		p<0.05, S	

Table 2 shows age wise distribution of lipid profile of healthy controls, in our study fasting to postprandial fall in TC, HDL, LDL and rise in TG, VLDL was statistically significant in all age groups.

Table 3: Age and lipid profile in IHD cases

Age in years		TC F	TC PP	TG F	TG PP	HDL F	HDL PP	LDL F	LDL PP	VLDL F	VLDL PP
31-40	Mean	182.90	171.70	159.10	223.90	43.10	38.40	108.10	88.70	31.60	44.60
	SD	13.87	12.88	37.18	54.15	2.96	2.80	18.60	16.26	7.41	10.76
	P	p<0.001, HS		p<0.001, HS		p<0.001, HS		p<0.001, HS		p<0.001, HS	
41-50	Mean	195.39	184.64	168.94	227.86	42.42	38.39	119.61	99.94	33.50	45.53
	SD	20.14	20.90	56.54	61.88	3.64	3.37	18.82	20.30	11.27	12.10
	P	p<0.001, HS		p<0.001, HS		p<0.001, HS		p<0.001, HS		p<0.001, HS	
51-60	Mean	181.92	170.80	174.00	249.80	41.60	37.36	106.02	84.20	34.28	49.32
	SD	21.04	21.32	59.19	84.45	4.05	3.66	20.77	22.20	11.93	17.03
	P	p<0.001, HS		p<0.001, HS		p<0.001, HS		p<0.001, HS		p<0.001, HS	
61-70	Mean	185.34	172.71	169.91	235.60	42.94	38.63	108.51	87.51	33.77	46.74
	SD	16.89	16.38	45.37	62.92	4.47	4.08	20.03	20.47	9.20	12.53
	P	p<0.001, HS		p<0.001, HS		p<0.001, HS		p<0.001, HS		p<0.001, HS	
70 and Above	Mean	201.53	191.47	172.53	233.00	41.53	37.53	125.68	107.95	34.32	46.21
	SD	22.47	22.41	44.11	53.07	4.73	4.01	18.21	18.90	8.82	10.58
	P	p<0.001, HS		p<0.001, HS		p<0.001, HS		p<0.001, HS		p<0.001, HS	

Table 3 shows age wise distribution of lipid profile of IHD cases, in our study fasting to postprandial fall in TC, HDL, LDL and rise in TG, VLDL was statistically significant when compared to healthy controls in all age groups. In the present study, 69.7% of participants were literate. Among these literate control group were 69.3% and cases were 70%. Approximately 30.3% participants were illiterate. Out of them 30.7% were controls and 30% were cases.

Table 4: Literacy **and lipid profile in IHD cases**

Literacy		TC F	TC PP	TG F	TG PP	HDL F	HDL PP	LDL F	LDL PP	VLDL F	VLDL PP
Literate	Mean	186.09	174.78	165.60	233.40	42.08	37.91	111.25	90.37	32.73	46.28
	SD	18.63	18.95	51.83	72.72	4.35	3.82	19.72	21.41	10.42	14.49
	P	p<0.001, HS		p<0.001, HS		p<0.001, HS		p<0.001, HS		p<0.001, HS	
Illiterate	Mean	194.11	183.00	182.44	246.62	42.46	38.17	115.37	96.00	36.28	49.00
	SD	24.32	24.60	51.06	58.92	3.38	3.37	22.98	23.29	10.18	11.73
	P	p<0.001, HS		p<0.001, HS		p<0.001, HS		p<0.001, HS		p<0.001, HS	

Table 4 shows literacy wise distribution of lipid profile of IHD cases, in our study fasting to postprandial fall in TC, HDL, LDL and rise in TG, VLDL was statistically significant in both literate and illiterates. In our study 59.3% out of healthy controls were rural and 40.7% were urban, and 58.3% out of IHD cases were rural and 41.3% were urban. In our study majority of IHD cases were from rural, may be due to patient flow is mainly from rural area.

Table 5: Locality and lipid profile in IHD cases

Literacy		TC		TG		HDL		LDL		VLDL	
		F	PP	F	PP	F	PP	F	PP	F	PP
Urban	Mean	186.79	175.64	167.90	235.25	41.41	37.41	112.03	91.61	33.33	46.45
	SD	20.40	20.80	51.68	69.75	3.78	3.55	20.24	22.90	10.33	14.00
	P	p<0.001, HS		p<0.001, HS		p<0.001, HS		p<0.001, HS		p<0.001, HS	
Rural	Mean	189.70	178.37	172.59	238.85	42.75	38.39	112.81	92.37	34.12	47.55
	SD	21.02	21.29	52.45	68.74	4.21	3.74	21.22	21.58	10.56	13.61
	P	p<0.001, HS		p<0.001, HS		p<0.001, HS		p<0.001, HS		p<0.001, HS	

Table 5 shows locality wise distribution of lipid profile of IHD cases, fasting to postprandial fall in TC, HDL, LDL and rise in TG, VLDL was statistically significant in both rural and urban population. Our study shown majority of healthy controls were farmers (46.7%) followed by labourer (24.7%), housewives (18.7%), unemployed (3.3%), with service (4%), business (2.7%). And Majority of IHD patients were farmers (35.3%) followed by labourer (21.3%), housewives (16%), unemployed (4%), service (6.7%), 16.7% with business. Our study shown however more percentage of Healthy controls with farmer by occupation and majority of IHD cases than healthy controls with business.

Table 6: Occupation and lipid profile in Healthy individuals

Occupation		TC		TG		HDL		LDL		VLDL	
		F	PP	F	PP	F	PP	F	PP	F	PP
Famer	Mean	186.79	175.64	167.90	235.25	41.41	37.41	112.03	91.61	33.33	46.45
	SD	20.40	20.80	51.68	69.75	3.78	3.55	20.24	22.90	10.33	14.00
	P	p<0.001HS		p<0.001HS		p<0.05S		p<0.001, HS		p<0.05,S	
Laborer	Mean	168.89	166.35	18.62	1135.83	42.32	40.59	103.24	99.05	23.35	26.78
	SD	16.43	16.49	19.43	18.99	2.97	3.07	12.57	12.67	3.91	3.72
	P	p<0.001HS		p<0.001HS		p<0.05S		p<0.001, HS		p<0.05,S	
Housewife	Mean	165.82	163.03	118.71	136.39	41.46	39.60	101.07	97.21	23.55	26.66
	SD	14.35	13.61	20.39	20.74	3.37	3.35	10.58	10.36	4.00	4.00
	P	p<0.001HS		p<0.001HS		p<0.05S		p<0.001, HS		p<0.05,S	
Unemployed	Mean	162.40	60.00	1121.60	140.00	40.40	38.60	98.00	93.60	24.00	27.80
	SD	9.44	9.02	19.42	15.36	3.50	3.911	5.83	5.54	3.67	2.94
	P	p<0.001HS		p<0.001HS		p<0.05S		p<0.001, HS		p<0.05,S	
Service	Mean	160.66	157.83	114.50	131.66	41.83	40.00	96.16	92.16	22.66	26.00
	SD	12.29	12.44	14.18	15.50	3.25	3.52	8.15	8.32	3.01	2.82
	P	p<0.001HS		p<0.001HS		p<0.05S		p<0.001, HS		p<0.05,S	
Businessman	Mean	181.25	178.75	140.50	157.00	43.00	41.50	110.50	106.50	27.75	30.75
	SD	24.43	23.30	10.72	10.39	4.69	4.65	23.30	21.56	2.21	2.21
	P	p<0.001HS		p<0.001HS		p<0.05S		p<0.001, HS		p<0.05,S	

Table 6 shows occupation wise distribution of lipid profile of Healthy individuals, fasting to postprandial fall in TC, HDL, LDL and rise in TG, VLDL was statistically significant.

Table 7: Occupation and lipid profile in IHD cases

Occupation		TC		TG		HDL		LDL		VLDL	
		F	PP	F	PP	F	PP	F	PP	F	PP
Famer	Mean	190.26	179.18	170.84	247.24	42.45	38.00	114.03	92.24	33.94	49.13
	SD	16.87	17.79	49.44	79.97	4.39	3.70	19.24	23.44	9.91	15.94
	P	p<0.001, HS		p<0.001, HS		p<0.05, S		p<0.001, HS		p<0.05, S	
Laborer	Mean	182.50	169.87	167.25	230.81	42.28	38.28	107.18	86.03	32.75	45.56
	SD	13.76	13.06	46.88	60.35	4.17	3.96	19.24	17.89	9.48	11.87
	P	p<0.001, HS		p<0.001, HS		p<0.05, S		p<0.001, HS		p<0.05, S	
Housewife	Mean	189.66	179.41	166.75	230.25	41.00	36.95	115.12	96.91	33.16	45.70
	SD	26.10	26.33	51.18	56.88	3.96	3.65	23.71	26.23	10.33	11.44
	P	p<0.001, HS		p<0.001, HS		p<0.05, S		p<0.001, HS		p<0.05, S	
Unemployed	Mean	157.66	146.50	95.33	157.16	41.66	37.50	99.00	77.83	18.66	31.16
	SD	10.46	8.43	6.21	28.48	5.24	5.85	11.79	8.06	1.21	5.84
	P	p<0.001, HS		p<0.001, HS		p<0.05, S		p<0.001, HS		p<0.05, S	
Service	Mean	193.50	182.90	205.50	253.30	42.00	38.40	110.50	93.10	40.90	50.40

	SD	21.66	21.64	27.54	32.91	2.62	1.95	25.09	22.46	5.54	6.41
	P	p<0.001, HS		p<0.001, HS		p<0.05, S		p<0.001, HS		p<0.05, S	
Businessman	Mean	196.72	185.60	182.48	244.52	42.92	38.56	117.52	97.72	36.24	48.60
	SD	24.20	24.20	61.29	72.03	3.68	3.37	21.63	20.04	12.15	14.38
	P	p<0.001, HS		p<0.001, HS		p<0.05, S		p<0.001, HS		p<0.05, S	

Table 7 shows occupation wise distribution of lipid profile of IHD cases, in our study fasting to postprandial fall in TC, HDL, LDL and rise in TG, VLDL was statistically significant when compared with controls irrespective of occupation. 114 (76%) IHD patients were overweight or obese and 25 (16.66%) controls were overweight or obese.

Table 8: Distribution of IHD cases and controls according to Past History

Past History	IHD	Control
DM	18	**0**
HTN	57	0
DM, HTN	20	0
Total	**150**	**150**

Table 8 shows BMI wise distribution of lipid profile of IHD cases, in our study fasting to postprandial fall in TC, HDL, LDL and rise in TG, VLDL was statistically significant when compared with controls in both normal and overweight IHD cases. In present study out of IHD patients 12% were with DM, 38% were with HTN, and 13.3% were with both DM and HTN. None of the Healthy controls was with DM or HTN.

Table 9: Past history and lipid profile of IHD cases

Past History		TC		TG		HDL		LDL		VLDL	
		F	PP	F	PP	F	PP	F	PP	F	PP
DM	Mean	192.40	181.78	203.45	271.89	41.51	37.59	110.37	89.45	40.21	54.08
	SD	22.40	23.47	23.50	37.57	3.48	3.20	24.21	25.42	5.19	7.46
	P	p<0.05, S		p<0.001, HS		p<0.05, S		p<0.001, HS`		p<0.001, HS	
HTN	Mean	190.60	179.98	165.28	228.38	42.57	38.28	115.19	96.27	32.68	45.34
	SD	21.56	22.10	49.92	59.18	4.06	3.60	20.94	21.67	9.97	11.81
	P	p<0.05, S		p<0.001, HS		p<0.05, S		p<0.001, HS`		p<0.001, HS	
DM+HTN	Mean	191.50	180.88	184.37	250.13	42.04	37.94	112.78	92.86	36.45	49.71
	SD	21.98	22.78	36.71	48.38	3.77	3.40	22.58	23.55	7.58	9.64
	P	p<0.05, S		p<0.001, HS		p<0.05, S		p<0.001, HS`		p<0.001, HS	

Table 9 shows past history wise distribution of lipid profile of IHD cases, in our study fasting to postprandial fall in TC, HDL, LDL and rise in TG, VLDL was statistically significant when compared with controls in all patients with history of DM, HTN or both. In present study out of IHD patients 63 (42%) were smokers, 11(7.33%) were alcoholic and 34 (22.6%) were tobacco chewers. None of Healthy controls was with anyaddiction.

Table 10: Personal history and lipid profile of IHD cases

Personal History		TC		TG		HDL		LDL		VLDL	
		F	PP	F	PP	F	PP	F	PP	F	PP
Smoking	Mean	187.01	174.88	170.42	236.65	42.85	38.46	110.46	89.46	33.61	46.74
	SD	19.43	19.26	52.69	71.16	4.06	3.57	18.44	18.17	10.52	14.30
	P	p<0.05, S		p<0.001, HS		p<0.05, S		p<0.001, HS`		p<0.001, HS	
Alcoholic	Mean	189.54	177.27	139.81	199.18	45.27	40.36	116.45	97.45	27.81	39.45
	SD	17.28	18.79	40.68	43.68	4.31	3.13	16.81	18.07	8.26	8.81
	P	p<0.05, S		p<0.001, HS		p<0.05, S		p<0.001, HS`		p<0.001, HS	
Tobacco	Mean	184.61	173.72	155.20	226.43	42.04	37.93	111.79	90.52	30.79	45.18
	SD	20.65	20.33	54.42	80.47	4.49	4.08	16.67	19.33	11.02	15.90
	P	p<0.05, S		p<0.001, HS		p<0.05, S		p<0.001, HS`		p<0.001, HS	

Table 10 shows personal history wise distribution of lipid profile of IHD cases, in this study fasting to postprandial fall in TC, HDL, LDL and rise in TG, VLDL was statistically significant when compared with controls in IHD cases with history of smoking, alcoholism or tobacco chewing.
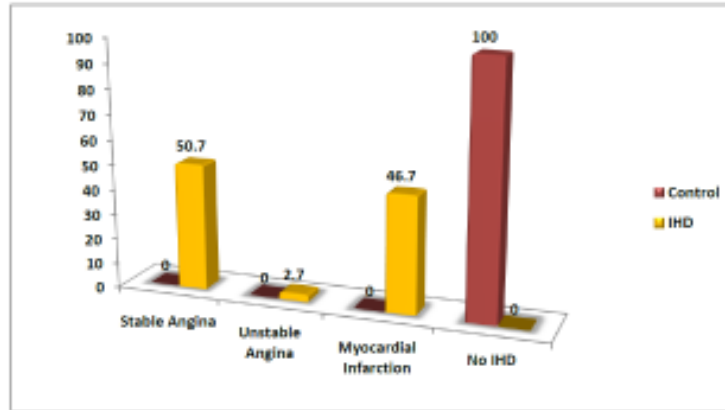
Figure 1: Distribution of IHD cases and controls according to type of IHD

Figure 1.shows distribution of patients according to type of IHD. Majority of patients had stable angina (50.7%) followed by myocardial infarction (46.7%) and unstable angina (2.7%)

Table 11: Lipid profile in Healthy Controls and IHD cases

	TC		TG		HDL		LDL		VLDL	
	Control	HD	Control	HD	Control	HD	Control	HD	Control	HD
F Mean(mg/dl)	168.87	188.50	120.59	170.65	41.82	42.20	103.30	112.49	23.81	33.80
PP Mean(mg/dl)	166.33	177.24	138.34	237.36	39.98	37.99	99.29	92.06	27.22	47.10

Table 11 shows comparison of fasting and postprandial lipid profile in healthy controls and IHD cases. In our study mean value of TC in healthy controls was 168.8 mg/dl in fasting state, 166.3 mg/dl in postprandial state and in IHD cases was 188.5 mg/dl in fasting state, 177.24 mg/dl in postprandial state. Mean for HDL in healthy controls was 41.82 mg/dl in fasting state, 39.98 mg/dl in postprandial state and in IHD cases was 42.20 mg/dl in fasting state, 37.99 mg/dl in postprandial state. Mean for LDL in healthy controls was 103.30 mg/dl in fasting state, 99.06 mg/dl in postprandial state and in IHD cases was 112.49 mg/dl in fasting state, 92.06 mg/dl in postprandial state.

Table 12: Fasting and postprandial lipid profile in controls

Paired Samples Statistics					
Variable		Mean	N	Std. Deviation	Std. Error Mean
Serum TC (mg/dl)	Fasting	168.87	150	16.57	1.35
	PP	166.33	150	16.45	1.34
Serum TG (mg/dl)	Fasting	120.59	150	19.54	1.59
	PP	138.34	150	19.13	1.56
Serum HDL(mg/dl)	Fasting	41.82	150	3.07	0.25
	PP	39.98	150	3.09	0.25
Serum LDL(mg/dl)	Fasting	103.30	150	13.16	1.07
	PP	99.29	150	13.20	1.07
Serum VLDL(mg/dl)	Fasting	23.81	150	3.91	0.32
	PP	27.22	150	3.71	0.30

Table 13: Fasting and postprandial lipid profile in controls (t test)

Variables		Mean difference	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		T	Df	P value Significance
					Lower	Upper			
Serum TC (mg/dl)	Fasting PP	2.54	1.10	0.09	2.36	2.71	28.20	149	P<0.01 HS
Serum TG (mg/dl)	Fasting PP	-17.74	2.47	-0.20	18.14	-17.34	-87.93	149	P<0.01 HS
Serum HDL (mg/dl)	Fasting PP	1.83	0.69	0.05	1.72	1.94	32.11	149	P<0.01 HS
Serum LDL (mg/dl)	Fasting PP	4.01	1.05	0.08	3.84	4.18	46.57	149	P<0.01 HS
Serum VLDL (mg/dl)	Fasting PP	-3.41	1.01	0.08	-3.58	-3.25	-41.11	148	P<0.01 HS

Table 12 and 13 shows lipid profile in control group. In healthy individuals the triglyceride level raised significantly from fasting to postprandial with a mean difference of 17.7 mg/dl (P= 0.000).VLDL levels increased significantly from fasting to postprandial (mean difference: 3.4mg/dl, P = 0.000).The levels of total cholesterol (mean difference 2.54mg/dl), HDL (1.83mg/dl) and LDL (4.01mg/dl) decreased from fasting to postprandial.

Table 14: Fasting and postprandial lipid profile in IHD cases

Variable		Mean	N	Std. Deviation	Std. Error Mean
Serum TC (mg/dl)	Fasting	188.50	150	20.75	1.69
	PP	177.24	150	21.06	1.72
Serum TG (mg/dl)	Fasting	170.65	150	52.01	4.24
	PP	237.36	150	68.95	5.63
Serum HDL(mg/dl)	Fasting	42.20	150	4.08	0.33
	PP	37.99	150	3.68	0.30
Serum LDL(mg/dl)	Fasting	112.49	150	20.76	1.69
	PP	92.06	150	22.07	1.80
Serum VLDL(mg/dl)	Fasting	33.80	150	10.44	0.85
	PP	47.10	150	13.74	1.12

Table 15: Fasting and postprandial lipid profile in IHD cases (t test)

Variables		Mean difference	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		T	Df	P value Significance
					Lower	Upper			
Serum TC (mg/dl)	Fasting PP	2.54	1.10	0.09	2.36	2.71	28.20	149	P<0.01 HS
Serum TG	Fasting PP	-17.74	2.47	0.20	-18.14	-17.34	-87.93	149	P<0.01 HS

(mg/dl) Serum HDL (mg/dl)	Fasting PP	1.83	0.69	0.05	1.72	1.94	32.11	149	P<0.01 HS
Serum LDL (mg/dl)	Fasting PP	4.01	1.05	0.08	3.84	4.18	46.57	149	P<0.01 HS
Serum VLDL (mg/dl)	Fasting PP	-3.41	1.01	0.08	-3.58	-3.25	-41.11	148	P<0.01 HS

Table 14, 15 shows fasting and postprandial lipid profile in IHD cases Present study showed that in IHD patients The triglyceride level raised significantly from fasting to postprandial with a mean difference of 66.71 mg/Dl (P = 0.0001). VLDL levels increased significantly from fasting to postprandial (mean difference: 13.3mg/dl, P = 0.000). The levels of total cholesterol (mean difference 11.25mg/dl), HDL (4.2mg/dl) and LDL (20.43mg/dl) decreased from fasting to postprandial. In our study Fasting levels of triglycerides (170.65 mg/dl), serum VLDL(33.80 mg/dl) and total cholesterol(188.50 mg/dl) in patients of IHD are significantly higher as compared to those in controls (120.59 mg/dl, 23.81 mg/dl,168.87 mg/dl respectively) difference between them is statistically significant (p < 0.001). Fasting serum HDL in IHD patients(42.02 mg/dl) is slightly more as compared to that in controls(41.82 mg/dl) but statistically not significant. Serum LDL is increased significantly in IHD patients (112.49 mg/dl) as compared to controls (103.30 mg/dl) in fasting state. Postprandially, TG levels in CHD patients are found to be raised significantly as compared to controls (p < 0.05) and fasting state (p < 0.001). Total cholesterol is high postprandially as compared to controls (p < 0.001) but decreased as compared to fasting in both controls (p > 0.05) and study group (p < 0.001).

Table 16: IHD Types and lipid profile

Personal History		TC		TG		HDL		LDL		VLDL	
		F	PP	F	PP	F	PP	F	PP	F	PP
Stable Angina	Mean	187.06	175.89	168.88	234.92	42.23	37.78	111.46	91.50	33.36	46.65
	SD	21.73	22.26	50.99	64.34	4.21	3.80	23.45	24.75	10.26	12.84
	P	p<0.001, HS		p<0.001, HS		p<0.001, HS		p<0.001, HS		p<0.001, HS	
Unstable Angina	Mean	184.00	175.25	96.25	149.00	41.50	37.75	123.75	105.75	18.75	31.75
	SD	3.74	3.40	1.70	11.04	4.65	4.85	3.30	2.63	0.50	2.87
	P	p<0.001, HS		p<0.001, HS		p<0.001, HS		p<0.001, HS		p<0.001, HS	
Myocardial Infarction	Mean	190.31	178.82	176.82	245.07	42.20	38.22	112.97	91.88	35.12	48.45
	SD	20.23	20.35	51.49	72.39	3.96	3.53	17.99	19.35	10.28	14.56
	P	p<0.001, HS		p<0.001, HS		p<0.001, HS		p<0.001, HS		p<0.001, HS	

Table 16 shows fasting to postprandial fall in TC, HDL, LDL and rise in TG, VLDL is statistically significant in patients of stable angina, unstable angina and myocardial infarction when compared with controls.

DISCUSSION

IHD was more common among males. These findings were consistent with the study done by Vakil et al, of the 5615 cases of ischemic heart disease, 78.8% were male and 21.2% female, the sex ratio being 3.7 to 1 for the entire series.[2] Similar findings were observed in a study by Haque et al in Malaysia. The prevalence of male CHD patient was twice as high as women, 110(69%) and 50(31%) respectively in this study.[3] It was similar to the observation of Ferduos et al, where in cases 31 were males and 19 were females and in controls 28 were males and 22 were females.[4] Mahalle N et al studied 300 CAD patients, out of it males and females were 216 (72%) and 84 (28%) respectively.[5] Similar results were observed in a study by Mohapatra TK et al. sex wise distribution of patients was 57.1% in males and 42.9% females.[6] Majority patients belong to 51- 70 yrs age group (62.6%). Range for age is 37-84yrs. Mean age of cases was 57.28± 7.56 yrs. Mean age of control was 57.06± 7.55 yrs. In a study by Vakil et al [2] and Ferduos et al [4] Similar findings were seen in Mahalle N et al where Mean age was 60.9 ± 12.4 years, and range was 25-92 years. [5] In contrast to our study Haque et al found that majority of patients (35%) belonged to 60-69 yrs age group followed by 70-79 yrs age group (34.2%).[3] In a study by Ghuge et al conducted at Marathawada region in Maharashtra it was found that IHD is more common in rural population above the age of

50 yrs.[7] Some studies were carried out in urban areas like Mandal *et al* where author studied patients from urban area.[8] Majority of patients were farmers (35.3%) followed by labourer (21.3%). 4% patients were unemployed, 6.7% with service, 16.7% with business and 16% were housewives. In another study by Vakil *et al* carried out in Bombay, it was found that patients were from professional, semi-professional, managerial, executive, business, officers as well as like mill worker, domestic servants, labourers and farmers. So it has fair cross section of population of Bombay city.82 It was observed in Mandal *et al* [8] that the prevalence of IHD increased with higher BMI (P<0.05). Similar results were recorded in Minakshi *et al.*[9] In this study out of IHD patients 12% were with DM, 38% were with HTN, and 13.3% were with both DM and HTN. Similar results were found in Haque *et al* this study found that 54% of the patients of IHD had hypertension (SBP>140 mmHg). It contributes to more than one third of premature mortality due to CHD and a greater proportion due to stroke (Yunus *et al* 2004)[10]. Similar results were seen in Minakshi *et al* [9] In Kolovou *et al* study on postprandial lipemia in hypertension suggest that patient with hypertension have an exaggerated response and delayed clearance of plasma TG concentration.[11] Similar results were observed in Haque *et al* 57% were diabetic and 43% were non-diabetic.[3] Our results were comparable with another study done in Malaysia and found that people with diabetes had a two to eight-fold more risk of developing heart disease (Khor, 1994, Martin-Timon *et al* 2014).[12,13] In Iso *et al* study, 52.1% patients were diabetic.[14] In present study out of IHD patients 42% were smokers, 7.33% were alcoholic and 34% were tobacco chewers. Similar results were seen in Haque *et al* where 46% of the study population was smoker, 31% non-smoker and 23% were ex-smoker respectively.[3] Our results were comparable with a study that showed cigarette smoking as the single most prevalent risk factor of CHD patients in Malaysia (Khor 1994; Quek *et al* 1989). [12,15] Another study by Mandal *et al*, also showed that the prevalence of IHD among smokers was higher than among non-smokers (P<0.01).[8] Majority of patients had stable angina (50.7%) followed by myocardial infarction (46.7%) and unstable angina (2.7%). Present study showed that in IHD patients the triglyceride level raised significantly from fasting to postprandial with a mean difference of 66.71 mg/dl (P = 0.0001).VLDL levels increased significantly from fasting to postprandial (mean difference: 13.3mg/dl, P = 0.000). The levels of total cholesterol (mean difference 11.25mg/dl), HDL (4.2mg/dl) and LDL (20.43mg/dl) decreased from fasting to postprandial. Similar results were observed in Samson *et al*, the triglyceride level showed a significant rise from fasting to 2 hours after

breakfast with a mean difference of 23.86 mg/dl (P =0.012). The level peaked at 4 hours after breakfast with a mean difference (MD) of 72.02 mg/dl (P =0.002). Subsequent triglyceride levels plateaued and were significantly higher than the baseline (P <0.05) until the 12th hour of observation. VLDL levels showed a similar pattern. In contrast, the levels of total cholesterol, HDL and LDL decreased postprandially.[16] In this study fall in TC, HDL, LDL and rise in TG, VLDL from fasting to postprandial was statistically significant in cases of stable angina, unstable angina and myocardial infarction compared to controls Similar findings were observed in Shankar *et al* where Fasting serum triglycerides, serum VLDL, serum LDL and total cholesterol were increased as compared to controls. And in contrast to our study serum HDL level was decreased in cases.[17] Similar results were seen in a study of Ferduos *et al*[4] In our study Postprandially, TG levels in CHD patients was found to be raised significantly as compared to controls (p < 0.05) and fasting state (p < 0.001). Total cholesterol was high postprandially as compared to controls (p < 0.001) but decreased as compared to fasting in both controls (p > 0.05) and study group (p < 0.001). Similar results were seen in Shankar *et al*. [17] So our study supports that it is important to include postprandial lipid profile in addition to the fasting lipid profile which helps in better cardiovascular risk assessment.

REFERENCES

1. Antman EM, Loscalzo J.Ischemic Heart Disease. In TR Haarrison. Harrison's Principles of Internal Medicine.19th ed. United States of America: McGraw Hill; 2008.p.1578-80.
2. Vakil RJ, Ischaemic Heart Disease in India. Br Heart J. 1963; 25(3):283–90.109
3. Haque AE, Yusoff FB, Ariffin MH, Hamid Mf, Hashim Sr, Haque M. Lipid Profile of the Coronary Heart Disease (CHD) Patients Admitted in a Hospital in Malaysia, JAPS 2016; 6(5):137-42.
4. Ferduos BA, Sultana N, Ahmed S, Khan EH, Sultana S, Parvin T. Serum Lipid Profile in Ischemic Heart Disease: A Cross-Sectional Analytical Study. Bangladesh J Med Biochem 2014; 7(1):14-6.
5. Mahalle N, Garg MK, Naik SS, Kulkarni Mv. Association of metabolic syndrome with severity of coronary artery disease, Indian J Endocrinol Metab. 2014; 18(5):708–14.
6. Mohapatra TK, Mohapatra RK. Evaluation of Serum Lipid Profile in Ischemic Heart Disease: A Hospital Based Study. Indian journal of applied research 2016; 6(5):546-7.
7. Ghuge GD, Zine R, Mogrekar M. Lipid Profile of Patients with Ischaemic Heart Disease From Rural Area of Marthawada Region, India. IJBAR 2012; 3(10):767-9.
8. Mandal S, Saha JB, Mandal SC, Bhattacharya RN, Chakraborty M, Pal PP. Prevalence of Ischemic Heart Disease Among Urban Population of Siliguri, West

Bengal. Indian Journal of Community Medicine 2009; 34(1):19-23.

9. Meenakshi SV, Saravanan S, Suresh KS, Anandan H. Postprandial Hypertriglyceridemia as an Independent Risk Factor for Ischemic Heart Disease. IJSS 2016; 4(6):165-7.

10. Yunus AM, Sherina M, Nor Afiah M, Rampal L, Tiew Kh. Prevalence of Cardiovascular Risk Factors in a Rural Community in Mukim Dengkil, Selangor. Malays J Nutr, 2004; 10(1): 5-11.

11. Kolovou GD, Anagnostopoulou KK, Daskalopoulou SS, Mikhailidis DP, Cokkinos DV. Clinical relevance of postprandial lipaemia, Curr Med Chem. 2005;12:1931-45.

12. Khor GL.Ethnic Characteristic of Coronary Heart Disease Risk Factor and Mortality in Peninsular Malaysia, Asia Pacific J Clin Nutr,1994; 3 (2): 93-8.

13. Martin-timon I, Sevillano-collantes C, Segura-galindo A. Type 2 diabetes and cardiovascular disease: Have all risk factors the same strength? World J Diabetes [serial on the Internet]. 2014 [cited 2016 Dec 8].;5(4) Available from:

https://www.ncbi.nlm.nih.gov › NCBI › Literature › PubMed Central (PMC)

14. Iso H, Imano H, Yamagishi K, Ohira T, Cui R, Noda H, et al. Fasting and nonfasting triglycerides and risk of ischemic cardiovascular disease in Japanese men and women: The Circulatory Risk in Communities Study (CIRCS). Atherosclerosis 2014;237:361-8.

15. Quek DL, Urn LY, Long SB. Cigarette smoking and the risk of myocardial infarction, and acute non-infarct coronary events among Malaysian women. Med J Malaysia, 1989; 44 (3): 210-223.

16. Samson CE, Galia AL, Llave KI, Zacarias Mb, Mercado-asis Lb. Postprandial Peaking and Plateauing of Triglycerides and VLDL in Patients with Underlying Cardiovascular Diseases Despite Treatment. Int J Endocrinol Metab. 2012; 10(4):587-93.

17. Shankar V, Kaur H, Dahiya K, Gupta MS. Comparison of Fasting and Postprandial Lipid Profile in Patients of Coronary Heart Disease. Bombay Hospital Journal 2008; 50(3):445-9