



Original Research Article

A comparative study of lipid profile, creatinine, blood sugar and urine level among diabetic and obese population of western Gorakhpur

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ABSTRACT

Modern life style is known to be responsible for sequence of manifestations like obesity and hyperlipidemia, hypercholesterolemia and atherosclerosis. Due to obesity, about 2.8 million people die every year worldwide. About 5% Indian were influenced by weight. This study includes 6Methodology for estimation of serum glucose 0 individuals, which includes 10 uncontrolled type-2 diabetic, 15 controlled type-2 diabetic, 15 obese and 20 healthy individuals. To study the lipid profile, creatinine, routine urine and fasting blood sugar for healthy, diabetic and obese subject various biochemical parameters like fasting blood sugar (FBS), total cholesterol (TC), triglyceride (TG), high density-lipoprotein cholesterol (HDL-c), low density lipoprotein cholesterol (LDL-c), very low density lipoprotein cholesterol (VLDL-c), creatinine, and qualitative urine were analysis. In current study more numbers of patients with abnormal blood glucose and lipid profile found to belong to the age group of 30-60 years, 71% participants have abnormal blood glucose and lipid profile as compared to younger participants of age group 20-30 years, 6% younger participants have normal blood glucose and lipid profile. The present study clearly established that, diabetes along with obesity has a direct effect on the physiological functioning of liver and heart, which is proven by various tests. It is also noted that high consumption of fat results in the accumulation of fat in the body which can cause cardiovascular diseases. Diabetes along with obesity results increase in the concentration of cholesterol, triglyceride, LDL, VLDL and decrease in HDL, which are well established in the risk factor of cardiovascular disease.

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1. Introduction

Obesity is one of the most serious health problems in the word between 1980- 2008 it was found that the world-wide prevalence of obesity is doubled. Due to obesity, about 2.8 million people die in every year. In India 5% of the nation's populace are influenced by obesity. In the World Health study, the pervasiveness of physical inertia in India was 9.3% in men and 15.2% in ladies. Obesity related diseases and its conditions follow with the similar rates of obesity. Many of diseases e.g. Diabetes mellitus, hypertension, anemia, dyslipidemia, cardiovascular diseases, cancer etc

are related to obesity.¹⁻³

Atherosclerosis is a characterized by thickening of arteries due to the accumulation of lipids (cholesterols, free and esterified) collagens fibrous tissue, proteoglycans, and calcium deposits, in the inner arterial wall. Atherosclerosis is a progressive disorders that narrows and ultimately blocks arteries. The development of atherosclerosis and the risk of CHD are directly correlated with plasma cholesterol and LDL, on the other hand plasma HDL inversely correlated with CHD.² The increased level of plasma HDL is correlated with a low incidence of cardiovascular disorders. Women have higher HDL and are less prone to heart diseases compared to men.^{2,4,5}

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Diabetes mellitus is the third leading cause of death in many developed countries. There are about 119.2 million people affected by diabetes type-2 in World-wide. The complication of diabetes affects eye, kidney and nervous system. It is a clinical condition, characterized by increased blood glucose level due to insufficient or efficient insulin. It is also responsible for the risk of coronary heart disease, cardiovascular diseases and peripheral vascular diseases.^{2,5,6}

Hyperlipidemia is defined as an increase in concentration of one or more plasma/serum lipids usually cholesterol and triglyceride. Diabetes type-2 patients have an increase in serum/plasma cholesterol, triglyceride, LDL and VLDL and decrease in HDL level, which is responsible for the high risk of coronary heart disease.⁷⁻¹¹

In Russia population, dyslipidaemia was detected in 84% diabetic patients and in European study, 40% were hyperlipidemia according to the criteria of the National cholesterol education program, (cholesterol and triglyceride greater than 200 mg/dl). An additional 23% showed hypertriglyceridaemia. In another study hyperlipidemia was found in 28% of diabetic patients.¹²⁻¹⁴

2. Materials and Methods

2.1. Study population and area

The study was done on 60 individuals, which includes 10 uncontrolled type-2 diabetic, 15 controlled type-2 diabetic, 15 obese and 20 healthy individuals. All diabetic patients were on medication with oral hypoglycemic drugs. Age matched healthy control subjects were selected from known families. The written consent of patients was also taken before starting the study. A record of clinical history and previous investigations of patients' disorders were compiled. The present area wise observational and analytical study will be conducted in the department of biochemistry, Baba Raghav Das Medical College, Gorakhpur, Uttar Pradesh.

To study the lipid profile, creatinine, routine urine and fasting blood sugar for healthy, diabetic and obese subject various biochemical parameters like fasting blood sugar (FBS), total cholesterol (TC), triglyceride (TG), high density-lipoprotein cholesterol (HDL-c), low density lipoprotein cholesterol (LDL-c), very low density lipoprotein cholesterol (VLDL-c), creatinine, and qualitative urine were analysis.

2.2. Sample collection and processing

Venous blood was collected from 60 volunteers; each donor blood sample was divided into two tubes. Serum was separated at 3000 rpm for 10 to 20 minutes. Supernatant collected in clean and dry serum test tube for analysis of fasting blood glucose, lipid profile and renal function test.¹⁴⁻¹⁷ Biochemical parameters, fasting blood sugar

and lipid profile, urea, creatinine were estimated by a colorimeter according to manufacturer's instructions by arkray kits.

2.3. Statistical analysis and data entry

The information was elicited on the performa designed for the purposed. The statistical analysis was performed by using IBM: SPSS Statistics Version 25. Qualitative/categorical variables were described as the number of cases and percentages while numerical/continuous variables, which follow a normal distribution and equality of variances, were presented in Mean \pm SD (standard deviation). For test of significance for the former case, χ^2 -test was used while of the latter; independence sample t-test was advocated. All comparisons are two-sided and the P-values of < 0.05 , < 0.01 and < 0.001 are taken as the cutoff values for significance, highly significant and very high significance respectively.

2.4. Estimation of serum glucose

Mix well and read the absorbance of the standard followed by the test against blank spectrophotometer / calorimetric at 520nm Table 1. Glucose concentration was calculated as follows-

$$\text{Glucose concentration (mg/dl)} = \text{OD.T/OD. S} \times 100$$

Reference value was taken as FBS 60-110mg/dl; RBS < 140 mg/dl

Glucose estimation gives important data about the course, seriousness and restorative control of diabetic mellitus. Fasting glucose levels surpassing 120mg/dl and 2 hours Post-prandial glucose levels surpassing 140mg/dl demonstrates a solid probability of diabetes mellitus. In the event that in an oral glucose resistance test, the plasma glucose dimension of 2 hours test surpasses 200mg/dl, the conclusion of diabetes mellitus is built up.

2.5. Estimation of serum creatinine

Picric acid in PH around 8 reacts with creatinine give rise to an orange coloured complex with the alkaline picrate.^{9,17} Intensity of the shading shaped is legitimately corresponding to the measure of creatinine present in the example.

Mix well and centrifuge at 2500-3000 RPM for 10 minutes to obtain a clear supernatant.

Pipette into clean, dry test tubes labeled as Blank (B), Standard (S), and Test (T) as table 2-

Mix well and keep the test tubes at room temperature for exactly 20 minutes. Measure the absorbance of the standard and test sample against the blank.

$$\text{Creatinine in mg\%} = \text{ABS. T/ABS. S} \times 2.0$$

Reference value of Serum creatinine was taken as 0.8-1.8 mg/dl

Creatinine is the catabolic product of creatine phosphate which is used by the skeletal muscle. Raised levels are

Table 1: Methodology for estimation of serum glucose

Pipette in to tube marked	Blank (μL)	Standard(μL)	Test(μl)
Serum/plasma	-	-	20
Standard	-	20	-
Working glucose reagent	1500	1500	1500
Mix well and incubate at 37°C for 10 minutes or at room temperature for 30 minutes.			
Distilled water	1500	1500	1500

Table 2: Methodology for estimation of serum creatinine

Addition sequence	Blank (B) (ml)	Standard (S) (ml)	Test (T) (ml)
Supernatant	-	-	1.1
Picric acid reagent	1.0	1.0	-
Distilled water	0.1	-	-
Creatinine standard	-	0.1	-
Buffer reagent	0.1	0.1	0.1

Table 3: Methodology for estimation of serum cholesterol

Pipette into tubes marked	Blank (B) (μl)	Standard (S) (μl)	Test (T) (μl)
Serum/plasma	-	-	10
Standard	-	10	-
Cholesterol reagent	1000	1000	1000

Table 4: Methodology for estimation of serum triglyceride

Addition sequence	Blank (μl)	Standard (μl)	Test (μl)
Serum/plasma	-	-	10
Standard	-	10	-
Triglyceride reagent	1000	1000	1000

Table 5: Methodology for estimation of serum HDL

Addition sequence		C	T
R1 reagent	450 μl	450 μl	450 μl
Calibrator	-	5 μl	-
Sample	-	-	5 μl
Mix and incubate for 5 min at 37°C			
R2 reagent	150 μl	150 μl	150 μl

found in renal dysfunction, decreased renal blood stream, diabetes acromegaly. Diminished dimensions are found in muscular dystrophy.

The reaction is temperature sensitive and all the tubes should be maintained at a uniform temperature.

2.6. Estimation of serum cholesterol

Serum cholesterol esters are hydrolyzed by cholesterol esterase to give free cholesterol and unsaturated fats. In ensuing response, Cholesterol oxidizes the 3-OH gathering of free cholesterol to free cholest-4-en-3-one and hydrogen peroxide.^{5,14} Within the sight of Peroxidase, hydrogen peroxide couples with 4-Aminoantipyrine and phenol to create red Quinoneimine dye. Absorbance of shaded color is estimated at 505 nm and is corresponding to measure of all out cholesterol focus in the Table 3.

Mix well and incubate at 37°C for 10 minutes or at room temperature for 30 minutes. Cholesterol concentration (mg/dl) = $\text{ABS. T/ABS. S} \times 200$

Reference value was taken as for normal <200mg/dl, borderline high risk 200-239mg/dl, high risk >240mg/dl

Serum cholesterol fills in as a marker of inclination towards Coronary Heart Disease, liver capacity, biliary function, intestinal ingestion, Thyroid capacity, and Adrenal ailment. Expanded cholesterol fixation is found in Idiopathic Hypercholesterolemia, hyperlipoproteinemia, nephrotic disorder, Hypothyroidism, nephrosis and diabetes mellitus. Hypercholesterolemia is known to be related with an expanded danger of coronary heart disease.

2.7. Estimation of serum triglyceride

Triglycerides are hydrolyzed by Lipoprotein Lipase to create Glycerol and free unsaturated fats. Glycerol 3-phosphate produced by reacting Glycerol Kinase and Adenosine Triphosphate phosphorylated Glycerol and Adenosine Diphosphate. Glycerol 3-phosphate is additionally oxidized by Glycerol 3-phosphate Oxidase to create DHAP and hydrogen peroxide. In the presence of Peroxidase, hydrogen peroxide couples with 4-Aminoantipyrine and 4-chlorophenol to create red Quinoneimine color.¹⁴⁻¹⁷

Absorbance of color is estimated at 505 nm and is relative to triglycerides fixation in the test Table 4.

Mix well and incubate at 37°C for 10 minutes. Read absorbance of standard and test against blank at 520nm calorimetrically.

$$\text{Triglycerides (mg/dl)} = \text{ABS. T/ABS. S} \times 200$$

Reference value was taken as for normal <150 mg/dl, borderline high 150-199 mg/dl, high 200-499 mg/dl and very high >500 mg/dl

Triglyceride family of lipids produced endogenously from carbohydrates and absorbed from the diet and is found in all plasma lipoproteins. Triglyceride measurement is an important tool in the diagnosis of hyperlipidemia. The high level of triglycerides is found in ischemic heart disease, hyperlipoproteinemia type 1 and 5, nephrotic syndrome, hypothyroidism, diabetes mellitus, acute pancreatitis, glycogen storage disease and tangier disease.

2.8. Estimation of serum high density lipoprotein

The direct HDL cholesterol assay^{9,18} is a homogenous method for directly measuring serum HDL-C levels without the need for any pretreatment and centrifugation step. First steps, substances with high affinity to LDL, VLDL and chylomicrons block them involving in enzyme reaction. Pipette into clean, dry test tubes labeled as blank (B), calibrator (C) and test (T) as Table 5.

Mix well and incubate for 5 minutes at 37°C. Measure the absorbance of calibrator and test against blank at 580nm.

$$\text{HDL (mg/dl)} = \text{ABS. T/ABS. S} \times 43$$

Reference value was taken for male 35 to 60 mg/dl, female 42 to 68 mg/dl.

2.9. Estimation of LDL-cholesterol and VLDL cholesterol

LDL cholesterol and VLDL cholesterol was estimated by friedwald's formula (1972)⁹ as-

$$\text{LDL-c} = \text{TC} - (\text{HDL-c} + \text{VLDL-c})$$

$$\text{VLDL-c} = \text{TG} / 5$$

Reference Values was taken as for LDL-c=Up to 190 mg/dl (2.0 -4.0 mmol/L), VLDL-c = 14 - 31.8 mg/dl (0.36 - 0.83 mmol/L).

3. Results

Among the 60 participant involved in this study, of which 53% (32) were male patient and 47% (28) were female patient. The patient criteria is divided into three groups as healthy, diabetic and obese. In these criteria, 12 male and 8 female were healthy, 10 male and 15 female were diabetic and 10 male and 5 female were obese. Figure 1 shoes the ratio of male and female patients of healthy, diabetic and obese. Figure 2 showing the age group differentiation of healthy, diabetic and obese patients.

In the age group of 20-30 year, there is 1 male and 2 healthy patient. No diabetic and obese patient is present in this age group. The age group of 30-40 year, 5 healthy, 2 diabetic, 4 obese male patients and 3 healthy, 3 diabetic, and 1 obese female patient were observed.

In the 40-50 year age group, there is 2 healthy, 2 diabetic, 3 obese male patients and 2 healthy, 4 diabetic, 2 obese female patient. The age group of 50-60 year, there is one healthy, 4 diabetic, 2 obese male patients and 1 healthy, 5 diabetic, and 2 obese female patients. Age group of 60-70 year, there is 1 healthy, 1 diabetic, no obese male patients and only one diabetic female patient.

Age group of 70-80 years, there is 2 healthy, one diabetic, one obese male patient and only 2 diabetic female patients.

Total 9 parameters were considered in the present study. They are fasting blood sugar (mg/dl), blood group, serum creatinine (mg/dl), lipid profile (cholesterol, triglyceride, high density lipoprotein, low density lipoprotein, very low density lipoprotein) (mg/dl) and urine complete. Each parameter is classified in to two groups, normal and abnormal according to their references value. The normal value of this parameter is for FBS 60-110 mg/dl, Serum creatinine 0.4-1.2 mg/dl, Cholesterol up to 200 mg/dl, Triglyceride up to 190 mg/dl, HDL 35-60 mg/dl, LDL up to 190 mg/dl, VLDL 14-31 mg/dl.

It may be observed from the Table 6, that among the diabetic patients (25), 100% are having abnormal fasting blood sugar concentration, healthy patients (20), 100% are having normal fasting blood sugar concentration, and obese patients (15) 87%(13) are having normal and 13%(2) are having abnormal fasting blood glucose concentration. The total sum of all type of patients (60) (healthy, diabetic and obese), 55% (33) having normal blood sugar concentration and 45% (27) having abnormal blood sugar concentration. The p-value is 0.150 which indicates that there is no significant association between all type of patients (healthy, diabetic and obese).

It may also be observed from Table 6 that among all diabetic patients (25), 100% are having normal serum creatinine concentration. Healthy patients (20) are also having 100% normal serum creatinine level. Among obese patients (15), 93% (14) having normal and 7% (1) having abnormal serum creatinine concentration. In case of total participants (60), 98% (59) are having normal

serum creatinine concentration and 2% (1) are having abnormal serum creatinine concentration. The p-value of this parameter is 0.154 which indicates that there is no significant association between all type of patients (healthy, diabetic and obese). According to Figure 3 20 healthy patients having normal FBS, 25 diabetic patients having abnormal FBS and 15 obese patients, in which 13 having normal FBS and 2 having abnormal FBS.

Figure 3 also differentiate all type of patients involved in this study on the basis of serum creatinine concentration, on which 20 healthy patients having normal serum creatinine, 25 diabetic patients having normal serum creatinine and 14 obese having normal serum creatinine and 1 obese having abnormal serum creatinine.

It may be observed from Table 7, that among the diabetic patients (25) 52% having normal cholesterol and 48% having abnormal cholesterol. The TG value of same patients having 48% normal and 52% abnormal. In case of healthy patients (20), 70% having normal cholesterol and 30% having abnormal cholesterol concentration. The TG value of same patients are 100% normal. In case of obese patients (15), 33% having normal cholesterol and 67% having abnormal cholesterol. The TG value of same patients are 47% normal and 53% are abnormal. The p-value of cholesterol is 0.032, which indicates there is not significant association of all type of patients. The p-value of TG is 0.001 which indicate very high significant association among all type of patients.

Total 14 and 20 healthy patient having normal cholesterol and TG concentration while 6 normal patients having abnormal cholesterol and no one abnormal TG. As same 13 and 12 diabetic patients have normal cholesterol and TG concentration while 12 and 13 diabetic patients having abnormal cholesterol and TG level respectively. In case of obese patients (15), 5 and 7 patients having normal cholesterol and TG concentration while 10 and 8 patients having abnormal cholesterol and TG level respectively.

In case of all diabetic patients (25), 68% having normal HDL concentration and 32% having abnormal HDL concentration. In case of all diabetic patients (25), 100% patients having normal LDL concentration. In case of all diabetic patients (25), 24% patients having normal VLDL concentration and 76% patients having abnormal VLDL concentration. In case of healthy patients (20), 80% patients having normal HDL concentration while 20% patients having abnormal HDL concentration. In case of healthy patients (20), 100% patients having normal LDL concentration. In case of healthy patients (20), 90% patients having normal VLDL concentration and 10% patients having abnormal VLDL value. In case of obese patients (15), 47% patients having normal HDL concentration while 53% patients having abnormal HDL concentration. In case of obese patients (15), 93% patients having normal LDL concentration while 7% patients having abnormal LDL

concentration. In case of obese patients (15), 13% patients having normal VLDL concentration while 87% patients having abnormal VLDL concentration. Among all type of patients (healthy, diabetic and obese) (60), 67% patients having normal HDL concentration while 33% patients having abnormal HDL concentration. As same, 98% patient having normal LDL concentration while 2% patients having abnormal LDL concentration and 43% patients having normal VLDL concentration while 57% having abnormal VLDL concentration.

Figure 5 showing total 16 healthy patients having normal HDL while 4 healthy patients having abnormal HDL. 17 diabetic patients having normal HDL while 8 diabetic patients having abnormal HDL. 7 obese patients having normal HDL while 8 obese patients having abnormal HDL. 20 healthy patients and 25 diabetic patients having normal LDL level while 14 obese patients having normal LDL and 1 obese patient having abnormal LDL. Total 18 healthy patients have normal VLDL and 2 healthy patients having abnormal VLDL. Total 6 diabetic patients have normal VLDL and 19 diabetic patients having abnormal VLDL. Two obese patients have normal VLDL and 13 obese patients having abnormal VLDL.

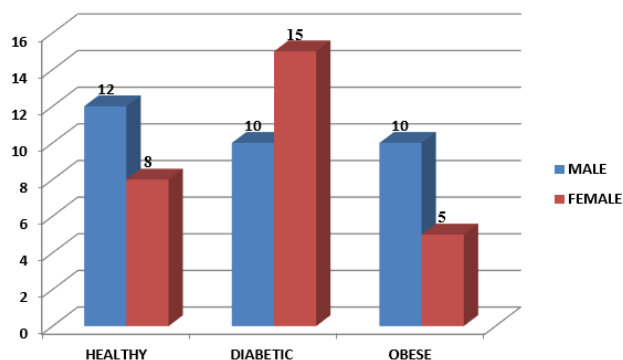


Fig. 1: Distribution of male female ratio of type of patients (healthy, diabetic and obese)

4. Discussion

Diabetes with obesity causes serious problem in health over weak, month or year after onset of the diseases.^{9,19-21} Diabetes can be caused by the abnormal functioning of insulin or dictated insulin.¹⁹⁻²¹ Diabetes along with obesity result in the increased concentration of cholesterol, triglycerides, LDL, VLDL, low concentration of HDL in the blood. Which are well stabilized risk factor of cardiovascular diseases.^{5,9,22,23}

In current study more numbers of patients with abnormal blood glucose and lipid profile found to belong to the age group of 30-60 years, 71% participants have abnormal blood glucose and lipid profile as compared

Table 6: Shows the results of FBS and serum creatinine among all type of patients

Type	Fasting blood sugar(FBS)		Serum creatinine	
	Normal	Abnormal	Normal	Abnormal
Diabetic (25)	0 (0%)	25 (100%)	25 (100%)	0 (0.0%)
Healthy (20)	20 (100%)	0 (0.0%)	20 (100%)	0 (0.0%)
Obese (15)	13 (87%)	2 (13%)	14 (93%)	1 (7%)
Total (60)	33 (55%)	27 (45%)	59 (98%)	1 (2%)
c2 –value	2.705		2.036	
P-value	<0.150		<0.154	

Table 7: Result of cholesterol and triglyceride of all type of patients

Type	Cholesterol		Triglyceride	
	Normal	Abnormal	Normal	Abnormal
Diabetic (25)	13(52%)	12(48%)	12(48%)	13(52%)
Healthy (20)	14(70%)	6(30%)	20(100%)	0(0.0%)
Obese(15)	05(33%)	10(67%)	7(47%)	8(53%)
Total (60)	32(53%)	28(47%)	49(82%)	21(18%)
c2 –value	4.582		22.349	
P-value	<0.032		<0.001	

Table 8: Result of LDL and HDL of all type of patients

Type	High density lipoprotein (HDL)		Low density lipoprotein (LDL)		Very low density lipoprotein (HDL)	
	Normal	Abnormal	Normal	Abnormal	Normal	Abnormal
	Diabetic (25)	17 (68%)	8 (32%)	25 (100%)	0 (0.0%)	6 (24%)
Healthy (20)	16 (80%)	4 (20%)	20 (100%)	0 (0.0%)	18 (90%)	02 (10%)
Obese (15)	7 (47%)	8 (53%)	14 (93%)	1 (7%)	2 (13%)	13 (87%)
Total (60)	40 (67%)	20 (33%)	59 (98%)	1 (2%)	26 (43%)	34 (57%)
c2 value	4.109		2.036		22.158	
P value	<0.043		<0.154		<0.001	

The p-value of HDL is 0.043, which is less significant, p-value of LDL is 0.154 which is not significant and p-value of VLDL is 0.001 which is highly significant.

Table 9: Mean and standard deviation of FBS, creatinine, cholesterol, TG, HDL, LDL, VLDL

Parameters	Type	Mean ± SD	t-value	P-value
FBS(mg/dl)	Healthy	86.0±10.68		
	Diabetic	177.0±53.80	4.931	0.150
	Obese	97.60±40.42		
S. creat (mg/dl)	Healthy	0.8040±0.18		
	Diabetic	0.782± 0.22	1.158	0.154
	Obese	0.8680±0.22		
Cholesterol (mg/dl)	Healthy	174.33±31.99		
	Diabetic	194.64±39.95	1.629	0.032
	Obese	215.07±35.57		
TG (mg/dl)	Healthy	112.00±34.71		
	Diabetic	195.64±57.85	1.183	<0.001
	Obese	220.80±75.97		
HDL (mg/dl)	Healthy	49.50±8.64		
	Diabetic	56.52±14.24	0.201	0.043
	Obese	55.67±10.51		
LDL (mg/dl)	Healthy	103.75±33.01		
	Diabetic	98.96±33.71	1.331	0.154
	Obese	115.27±43.22		
VLDL (mg/dl)	Healthy	22.35±6.91		
	Diabetic	39.20±11.61	1.158	<0.001
	Obese	44.13±15.18		

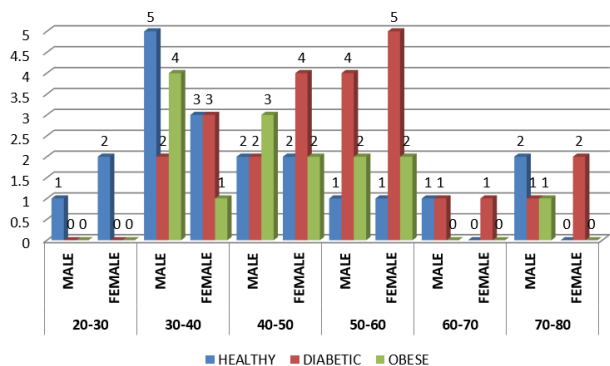


Fig. 2: Age group differentiation of healthy, diabetic and obese patients

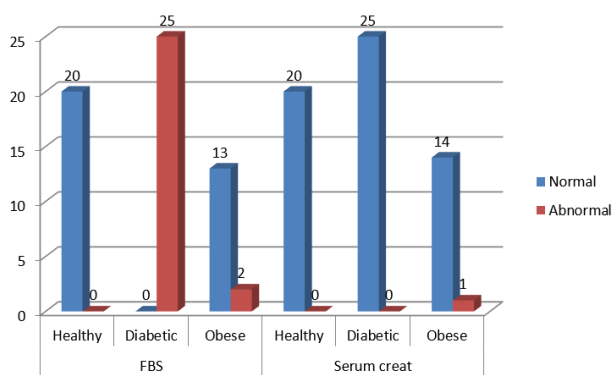


Fig. 3: Differentiation of all type of patients as the classification of normal and abnormal value of FBS and Serum Creatinine

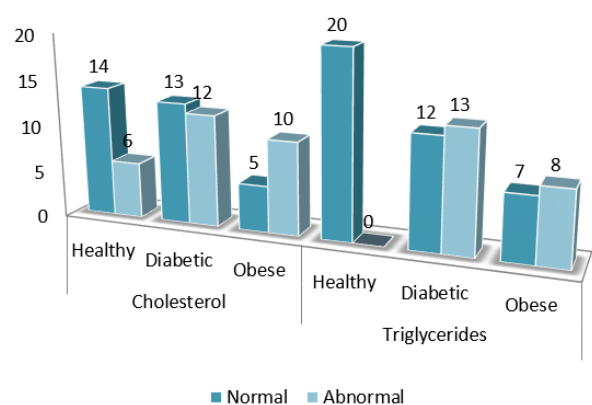


Fig. 4: Show the relationship between all type of patients (healthy, diabetic and obese) on the basis of cholesterol and TG concentration

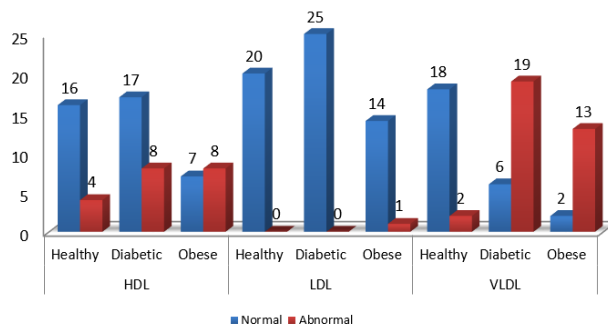


Fig. 5: Relationship of HDL, LDL and VLDL among patients (healthy, diabetic and obese)

to younger participants of age group 20-30 years, 6% younger participants have normal blood glucose and lipid profile.^{15,24,25}

In the context of western Gorakhpur society 18% male, 27% female has abnormal blood glucose level and 17% male, 9% female has an abnormal lipid profile. In this area 35% male has diabetes along with obesity and 36% female also have diabetes along with obesity.

Glucose is the main source of energy for body tissue and cell. In this current study, it was found that, 45% participants have abnormal blood sugar and 55% participants have normal blood sugar. While in the case of serum creatinine 98% have normal and 2% abnormal level. In this present study from Table 6, among the all diabetic patients are abnormal blood glucose levels with normals. creatinine, while in case of obesity 98% patients have normals. creatinine and 2% have abnormal creatinine.¹⁷ The p-value of FBS and creatinine is 0.150 and 0.154 respectively. This indicates there is no significant relation between all types of patients.

Lipid profile levels in healthy, diabetic and obese patients were found to be significant in the present study. In this study, it was found that, 48% diabetes patients have abnormal cholesterol and 52% TG. While in obese patients 47% have abnormal cholesterol and 18% have abnormal triglyceride. In this study from the Table 7, it was found that the p-value of cholesterol is 0.32 which is less significant and p-value of triglyceride is <0.001 which is highly significant among all types of patients (diabetic and obese).

In the case of HDL, LDL and VLDL from the Table 8, it was found that out of total participant 33% have abnormal HDL, 67% have normal HDL, 98% have normal LDL, 2% have abnormal LDL and 57% have abnormal VLDL and 43% have normal VLDL. From the Table 8 it was found that the p-value of HDL is 0.043 which is less significant. The p-value of LDL is 0.154 which is not significant. The p-value of VLDL is <0.001 which is highly significant.

The majority (94%) of the people had the fasting blood sugar level greater than 125mg/deal^{17,19} and also have

found to be significantly higher [P value = <0.0001] than controls. In cases the mean TC levels, TG levels, LDLc levels, VLDLc levels found to be $225.95 \pm 24.51 \text{ mg\%}$, $175.35 \pm 24.45 \text{ mg\%}$, $170.77 \pm 18.86 \text{ mg\%}$, $35.03 \pm 4.89 \text{ mg\%}$ and it was found to be higher than controls.^{5,12} However, the mean HDLc value and the HDLc /LDLc ratio were found to be $37.03 \pm 7.84 \text{ mg\%}$ and 0.44 ± 0.25 which was higher than those reported in the cases. A significant difference (P<0.0001) was found between cases and control population when the serum TC, TG, HDLc values, LDLc values, VLDLc values, HDLc /LDLc ratio were compared between them.¹⁴

Elevated level of blood glucose has been founded on patient with blood group of O+VE and elevated level of blood glucose with lipid profile have been found in patients with blood group of A+VE.

In the current study, it was found that 48% diabetic patient have excreted glucose in the urine, which indicates that these patients are belong to the group of uncontrolled diabetic type 2 and their blood glucose level in the blood is higher than the renal threshold of glucose (180md/dl). In case of urinary protein, 50% participant has excreted protein in urine, among which maximum number of patients have diabetes type 2.

It was established the of lipid profile with body mass index in young healthy students. They were found, no significant difference in serum total cholesterol (P=0.37), LDL-C (P= 0.53) triglycerides (P=0.06) and HDL-C, (P=0.54) in three BMI groups. The findings of our study are consistent with the previous studies. Being overweight or obese can lead to adverse metabolic effects on, cholesterol and triglycerides. Free fatty acids (FFA) are released in abundance from adipose tissue mass. As a result, FFA builds the liver's generation of TG and secretion of VLDL. Hypertriglyceridaemia and VLDL diminish HDL cholesterol. Circling FFA, may add to the acceptance of hypertension. They were discovered that the most elevated rate pervasiveness of overweight is the significant main impetuses in the improvement of diabetes mellitus and metabolic disorder. We concluded from this study that obesity in a significant number of young medical student population. This prevalence may be due to lack of awareness and unhealthy lifestyles, so health education and more preventive measures should decrease the prevalence of obesity and cardiac risks in our medical college by modifying their lifestyle.

5. Conclusion

The present study clearly established that, diabetes along with obesity has a direct effect on the physiological functioning of liver and heart, which is proven by various tests. It is also noted that high consumption of fat results in the accumulation of fat in the body which can cause cardiovascular diseases. Diabetes along with

obesity results increase in the concentration of cholesterol, triglyceride, LDL, VLDL and decrease in HDL, which are well established in the risk factor of cardiovascular disease.

6. Source of funding

None.

7. Conflict of interest

None.

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