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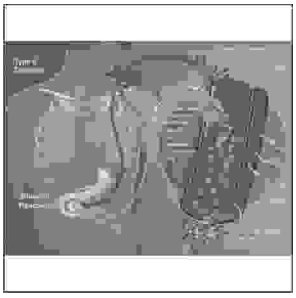

TYPE 2 DIABETICS;

THE RELATIONSHIP BETWEEN THE SERUM CHOLESTEROL AND TRIGLYCEROIDS.

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ABSTRACT… ranamohsindr1@hotmail.com **Objective:** To find the relationship between the serum cholesterol and triglyceroid in type 2 diabetics with different parameters of obesity. **Design:** Descriptive study. **Setting:** Al-Shifa Metabolic Center Faisalabad. **Period:** From January 2003 to June 2005. **Material and methods:** A total of 2034 patients, who fulfill the inclusion criteria were included in this study. Out of these patients 1188 females and 846 males, patients presented to the metabolic center for lipids screening. Body parameters i.e. weight, height, waist and hip circumference and blood pressure. BMI and WHR were calculated as per standard. Fasting serum cholesterol and triglyceroid were tested on capillary blood by GCT meter. **Results:** There is a sharp and definite increase in the % of patients having > 200 mg/dl total cholesterol after 10 years of DM, from 34-36% to 59%. More patients in above 50 age group had higher than 200-mg/dl-cholesterol i.e.38%, 50% and 36% than below 50 years i.e. 30% and 24%. Serum triglyceroid levels in the middle range of 150-300 had a definite ascending relationship with increasing BMI, 17%, 47% and 71% respectively. High WHR in both sexes had the strongest relation with high serum cholesterol both in 150-200 and >200 mg/dl range, 37% and 41% and 40 and 41% respectively. Serum triglyceroid was definitely higher in patients with high WHR in both sexes in 150-300 ranges. **Conclusions:** It is clearly evident that the duration of hyperglycemia, age at onset of DM and the central obesity, all increases the chances of having hypercholesteremia. It is again evident that so many other factors influence the incidence of hypercholesteremia; screening is the only way to pick these patients. Every patient with any component of the Metabolic Syndrome must be screened for other components for optimal stratification of the coronary risk factors.

Key words: Diabetes, Cholesterol, Triglyceroid, Metabolic Syndrome, Obesity.

INTRODUCTION

Diabetes Mellitus or insulin resistance, Central Obesity, Dyslipedemia and Hypertension are the integral components of the Metabolic Syndrome. All are known risk factors for Coronary Heart Disease (CHD). Aggregation of risk factors increases the risk of having

CHD in any given individual. Incidence of dyslipedemia in Diabetics is determined by multiple factors like genetic background, associated central obesity, duration and degree of uncontrolled hyperglycemia and the age of onset of clinical diabetes. Obesity is defined by standard weight height scales, BMI and waist hip ratio.

Dyslipedemias are the integral component of the Metabolic Syndrome. Associated hypercholesteremia and hypertriglyceroidemia in diabetics increases the chances of having coronary heart disease. Treatment of dyslipedemias is now an established component of management of CHD and CHD equivalent states, CVA and DM being the most common. Screening by testing total serum cholesterol is recommended followed by complete lipid profile if necessary. Multiple factors determine the incidence of lipid abnormalities in diabetics. Genetic background, duration of clinical diabetes, adequacy of glycemic control, degree of obesity by different parameters and age of the patient are the common and important factors. We decided to study all these parameters in our diabetic patients so as to fulfill our responsibility of defining the CHD risks in our patients. This is also an attempt to define the strength of each parameter in our own population.

MATERIALS AND METHODS

All type 2 diabetics presenting at the consultancies of the authors were invited to participate in this study. All were given appointment at the Al-Shifa metabolic center, Faisalabad, for lipids screening. Fasting capillary blood was drawn for testing sugar, total cholesterol and triglyceroid level on Accutrend GCT meter. The specially trained diabetic nurses recorded basic biodata and other information and patients were evaluated by the referring physician. Age, duration of clinical diabetes, weight with ordinary summer clothes and height without shoes was recorded. The upper range of the reference weight was selected as the reference for being overweight. Body Mass Index (BMI) was calculated from the standard Weight in Kilogram divided by Height in meters square formula. Waist was measured at the level of umbilicus in lying position and hip was measured at the level of the broadest diameter of hips in standing position. A waist hip ratio (WHR) above 0.85 for females and 0.9 for males was taken to be abnormal as a risk factor for CHD[1-3]. Cholesterol and triglyceroid levels were evaluated in the background of age, duration of DM, weight, BMI and abnormal WHR. The study includes patient evaluated from January 2003 to June 2005.

EXCLUSION CRITERIA.

Seriously sick patient,
Patient who cannot stand erect for any reason,
Patients with clinical ascites,
Patients with umbilical hernia,
Patients already on lipid lowering drugs,
Patients having attack of MI in last 6 months.
Patients with clinically evident cirrhosis of liver.

RESULTS

A total of 2034, 1188 females and 846 males, patients presented to the metabolic center for lipids screening from January 2003 to June 2005. There is a sharp and definite increase in the % of patients having > 200 mg/dl total cholesterol after 10 years of DM, from 34-36% to 59%. More patients in above 50 age group had higher than 200-mg/dl-cholesterol ie.38%, 50% and 36% than below 50 years i.e. 30% and 24%.

Being overweight and the degree of obesity by standard weight height scales didn't have any definite or linear relationship with degree of hypercholesteremia. More patients in 0-10 Kg overweight group had cholesterol level above 200 mg/dl, 45% against 33% in underweight group and around 35% in above 10 Kg group.

More patients in normal BMI range of 25-28 had >200 Mg/dl Cholesterol than abnormal BMI range of >28, 47% against 36%. Even 13% of patients in <25 BMI range had higher cholesterol levels. Serum triglyceroid levels in the middle range of 150-300 had a definite ascending relationship with increasing BMI, 17%, 47% and 71% respectively. High WHR in both sexes had the strongest relation with high serum cholesterol both in 150-200 and >200 mg/dl range, 37% and 41% and 40 and 41% respectively. Serum triglyceroid was definitely higher in patients with high WHR in both sexes in 150-300 ranges.

249 patients were below 40 years of age. 495 patients were 40-49 years old. 750 patients were 50-59 years old, 423 patients were 60-69 years old and 120 patients were 70 or more years of age.

Table-I. Lipid and duration of diabetes.

Duration of Diabetes	Cholesterol range	No. and % patients	Triglyceroids range	No. and % patients
< 1Year	Total pt. > 150 MG/DL 150-200 MG/DL >200 MG/DL	161 30 (19%) 73 (45%) 58 (36%)	Total pt. < 150 MD/DL 150-300 MG/DL > 300 MG/DL	87 28 (32%) 41 (47%) 18 (21%)
1-4 Years	Total pt. > 150 MG/DL 150-200 MG/DL >200 MG/DL	147 32 (22%) 64 (44%) 51 (35%)	Total pt. < 150 MD/DL 150-300 MG/DL > 300 MG/DL	83 31 (37%) 37 (45%) 15 (18%)
5-9 Years	Total pt. > 150 MG/DL 150-200 MG/DL >200 MG/DL	202 53 (26%) 80 (40%) 69 (34%)	Total pt. < 150 MD/DL 150-300 MG/DL > 300 MG/DL	95 31 (33%) 52 (65%) 12 (13%)
10-14 Years	Total pt. > 150 MG/DL 150-200 MG/DL >200 MG/DL	106 32 (30%) 30 (28%) 44 (42%)	Total pt. < 150 MD/DL 150-300 MG/DL > 300 MG/DL	37 16 (43%) 15 (41%) 6 (16%)
> 15 Years	Total pt. > 150 MG/DL 150-200 MG/DL >200 MG/DL	61 9 (15%) 16 (26%) 36 (59%)	Total pt. < 150 MD/DL 150-300 MG/DL > 300 MG/DL	31 8 (26%) 17 (55%) 6 (19%)

According to Table 1, there is a sharp definite increase in the % of patients having > 200 mg/dl total cholesterol after 10 years of DM, from 34-36 to 59%. Similar trend was not seen in triglyceroid levels.

Being overweight and the degree of obesity by standard weight height scales didn't have any definite or linear relationship with degree of hypercholesteremia. More patients in 0-10 Kg overweight group had > 200 mg/dl cholesterol level, 45% against 33% in underweight group and around 35 above 10 Kg group. Serum triglyceroid level did not show any definite trend. Table III.

More patients in normal BMI range of 25-28 had >200 Mg/dl Cholesterol than abnormal BMI range of >28, 47 against 36%. Even 13% of patients in <25 BMI range had higher cholesterol levels. Serum triglyceroid levels in the middle range of 150-300 had a definite ascending relationship with increasing BMI, 17, 47 and 71% respectively. Table IV. More patients in above 50 age group had higher than 200 mg/dl cholesterol ie.38, 50 and 36% against 30 and 24%. Similar trend was not seen in triglyceroid levels as in Table II.

High WHR in both sexes had the strongest relation with high serum cholesterol both in 150-200 and >200 mg/dl range, 37 and 41% and 40 and 41% respectively. Serum triglyceroid was definitely higher in patients with high WHR in both sexes in 150-300 ranges. Same trend didn't persist in >300 mg/dl range. Table V.

Table-II. Lipid and age distribution.				
Age Range	**Cholesterol Range**	**No and % Patients**	**Triglyceroids Range**	**No. and % Patients**
< 40	Total pt. < 150 MG/DL< 150-200 MG/DL >200 MG/DL	84 29 (35%) 30 (36%) 25 (30%)	Total pt. < 150 MD/DL 150-300 MG/DL > 300 MG/DL	41 15 (37%) 23 (56%) 3 (73%)
40-49	Total pt. < 150 MG/DL< 150-200 MG/DL >200 MG/DL	258 136 (53%) 60 (23%) 62 (24%)	Total pt. < 150 MD/DL 150-300 MG/DL > 300 MG/DL	96 25 (26%) 28 (29%) 43 (45%)
50-59	Total pt. < 150 MG/DL< 150-200 MG/DL >200 MG/DL	250 52 (21%) 104 (42%) 94 (38%)	Total pt. < 150 MD/DL 150-300 MG/DL > 300 MG/DL	132 41 (31%) 72 (55%) 19 (14%)
60-69	Total pt. < 150 MG/DL< 150-200 MG/DL >200 MG/DL	141 25 (18%) 45 (32%) 71 (50%)	Total pt. < 150 MD/DL 150-300 MG/DL > 300 MG/DL	66 23 (35%) 29 (44%) 14 (21%)
> 70	Total pt. < 150 MG/DL< 150-200 MG/DL >200 MG/DL	39 5 (13%) 20 (51%) 14 (36%)	Total pt. < 150 MD/DL 150-300 MG/DL > 300 MG/DL	22 9 (41%) 11 (50%) 2 (9%)

Table-III. Lipid and weight distribution.				
Weight Range	**Cholesterol Range**	**No and % Patients**	**Triglyceroids Range**	**No. and % Patients**
Under Weight	Total pt. < 150 MG/DL< 150-200 MG/DL >200 MG/DL	149 45 (30%) 55 (37%) 49 (33%)	Total pt. < 150 MD/DL 150-300 MG/DL > 300 MG/DL	80 32 (40%) 35 (44%) 13 (16%)
0-5 Kg	Total pt. < 150 MG/DL< 150-200 MG/DL >200 MG/DL	134 24 (18%) 50 (37%) 60 (45%)	Total pt. < 150 MD/DL 150-300 MG/DL > 300 MG/DL	66 29 (44%) 24 (36%) 13 (20%)
6-10 Kg	Total pt. < 150 MG/DL< 150-200 MG/DL >200 MG/DL	112 22 (20%) 40 (36%) 50 (45%)	Total pt. < 150 MD/DL 150-300 MG/DL > 300 MG/DL	56 19 (29%) 30 (54%) 7 (13%)
11-20 Kg	Total pt. < 150 MG/DL< 150-200 MG/DL >200 MG/DL	150 28 (19%) 68 (45%) 54 (36%)	Total pt. < 150 MD/DL 150-300 MG/DL > 300 MG/DL	72 19 (26%) 39 (54%) 14 (19%)
> 20Kg	Total pt. < 150 MG/DL< 150-200 MG/DL >200 MG/DL	134 27 (20%) 61 (46%) 46 (34%)	Total pt. < 150 MD/DL 150-300 MG/DL > 300 MG/DL	85 15 (18%) 68 (94%) 2 (2%)

Table-IV. lipid and bmi.				
MBI Range	**Cholesterol Range**	**No and % Patients**	**Triglyceroids Range**	**No. and % Patients**
BMI <25	Total pt. < 150 MG/DL< 150-200 MG/DL >200 MG/DL	150 57 (38%) 73 (49%) 20 (13%)	Total pt. < 150 MD/DL 150-300 MG/DL > 300 MG/DL	110 47 (43%) 19 (17%) 44 (40%)
BMI 25-28	Total pt. < 150 MG/DL< 150-200 MG/DL >200 MG/DL	218 32 (15%) 84 (39%) 102 (47%)	Total pt. < 150 MD/DL 150-300 MG/DL > 300 MG/DL	115 41 (36%) 54 (47%) 20 (17%)
BMI > 28	Total pt. < 150 MG/DL< 150-200 MG/DL >200 MG/DL	247 53 (21%) 105 (43%) 89 (36%)	Total pt. < 150 MD/DL 150-300 MG/DL > 300 MG/DL	129 22 (17%) 91 (71%) 16 (13%)

Table-V. Lipids and WHR in relation with sex.				
WHR and Sex	**Cholesterol Range**	**No. and % Patients**	**Triglyceroids Range**	**No. and % Patients**
Females Normal WHR	Total pt. < 150 MG/DL< 150-200 MG/DL >200 MG/DL	31 14 (45%) 13 (42%) 4 (13%)	Total pt. < 150 MD/DL 150-300 MG/DL > 300 MG/DL	20 14 (170%) 5 (25%) 1 (5%)
Females High WHR	Total pt. < 150 MG/DL< 150-200 MG/DL >200 MG/DL	366 82 (22%) 137 (37%) 147 (40%)	Total pt. < 150 MD/DL 150-300 MG/DL > 300 MG/DL	188 54 (29%) 106 (56%) 28 (15%)
Males Normal WHR	Total pt. < 150 MG/DL< 150-200 MG/DL >200 MG/DL	16 7 (43%) 3 (18%) 6 (37%)	Total pt. < 150 MD/DL 150-300 MG/DL > 300 MG/DL	16 7 (43%) 4 (25%) 5 (31%)
Males High WHR	Total pt. < 150 MG/DL< 150-200 MG/DL >200 MG/DL	246 43 (17%) 102 (41%) 101 (41%)	Total pt. < 150 MD/DL 150-300 MG/DL > 300 MG/DL	77 48 (52%) 16 (33%) 13 (17%)

DISCUSSION

Diabetes is a very common disorder whose treatment demands much more than the glycemic control. Diabetes is one of the defining features of the Metabolic Syndrome. Central obesity and dyslipedemias are the other components along with hypertension[4,5]. Because adiposity is related to insulin resistance and insulin resistance is a risk factor for type 2 diabetes and cardiovascular disease, a consensus has emerged that increased adiposity is responsible for the increased incidence of type 2 diabetes and its associated morbidity. In addition, evidence has accumulated indicating that visceral adiposity in particular is associated with insulin resistance and the metabolic syndrome[6-11]. Treatment of Diabetes is not limited to achieving tight glycemic control alone, as it doesn't prevent CHD[12]. Other components of the metabolic syndrome must be addressed at the same time.

Three parameters i.e. standard weight height scales, BMI

and WHR, determine obesity. Abnormal WHR has the strongest metabolic implications. Though WHR determinations involve both abdominal subcutaneous and abdominal visceral fat, which has more metabolic implications, it is an adequate surrogate clinical parameter[13]. An apparently lean and thin person may have an abnormal WHR and vice versa. A person with low BMI may have an abnormal WHR and vice versa. Grossly obese persons by weight height scales may have a normal WHR but otherwise qualify to be obese by crossing the waist circumference limit of 40 inches for males and 35 inches for females[14]. The degree of obesity by the parameter of ideal body weight didn't have any definite or linear relationship with degree of hypercholesteremia.

Diabetes Mellitus in itself has a metabolic influence to contribute in dyslipedemias especially in the presence of central obesity through a complex mechanism, partly determined by genes whose expression is modified by environmental factors[15]. Degree of hyperglycemia and the duration of the uncontrolled hyperglycemia have a definite adverse metabolic influence in terms of dyslipedemia. Lipids screening is recommended in every type 2 diabetic. For both fasting serum cholesterol and triglyceroid value below 200mg/dl is considered to be normal in normal healthy individuals. In diabetics values below 150 mg/dl is desirable[16].

Comprehensive treatment of diabetes involves defining other components of the metabolic syndrome. Lifestyle modification to bring weight and WHR into the normal range by optimizing the caloric intake along with increasing the caloric expenditure through increased physical activity within the limits set by the cardiopulmonary functional status, peripheral arterial disease and the status of the musculoskeletol system. It is clearly evident that the duration of hyperglycemia, age at onset of DM and the central obesity, all increases the chances of having hypercholesteremia. It is again evident that so many other factors influence the incidence of hypercholesteremia; screening is the only way to pick these patients. Every patient with any component of the Metabolic Syndrome must be screened for other components for optimal stratification of the coronary risk factors.

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