

Original Articles

CHANGES IN PLASMA LIPIDS AND BLOOD GLUCOSE CONCENTRATION OF OBESE PATIENTS

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Abstract

The investigation was conducted on 50 women, comprising 25 each of obese and thin subjects, belonging to different localities of Faisalabad town, 5 ml venous blood collected aseptically from overweight fasting ladies was analysed for its total lipid, plasma cholesterol, phospholipids, triglycerides and blood sugar contents. Furthermore the effects of age, weight and abdominal circumference on blood values have been reported.

Obese subjects exhibited 11 to 57 percent overweight over their desired weights. Generally an increased weight gaining tendency with advancing age was seen. The average values for total lipids, cholesterol, phospholipids, triglycerides and glucose in the obese were 548, 275, 156, 121 and 99 mg/100 ml respectively as compared to 381, 176, 107, 71 and 72.5 mg/100 ml respectively in the nonobese females. Body weight showed a statistically significant correlation with plasma total lipids, cholesterol, phospholipids, triglycerides and glucose. Age also had a correlation with total lipids, cholesterol & phospholipids. Similarly abdominal circumference gave a highly significant correlation with total lipids and plasma cholesterol.

Introduction

Obesity has become a common nutritional disorder in almost every society due to sedentary life coupled with excessive consumption of carbohydrates and high calorie food commodities than required to meet the metabolic needs of the body. If unchecked obesity carries its risks of impaired life expectancy, with an increased tendency to diabetes mellitus, coronary artery disease, esteroarthritis and probably hypertension and varicose veins. Primary disturbances of pituitary, adrenals, thyroid or gonads are rare but metabolic disturbances of secondary nature are frequent though reversible.

Material and Methods

This study was conducted on 25 obese and the same number of normal women selected from various localities of Faisalabad city. The differentiation of obese from normal females

was made according to the suggestions of Metropolitan Life Insurance Company (Davidson and Passmore, 1967). Accordingly a woman of a given age group having 10 percent weight over and above her standard weight, as calculated on the basis of age and height, was considered obese.

For blood component determinations about 5 ml of venous blood was collected aseptically from each of the overweight and normal weight fasting women, during early hours of the day, using 0.01 ml of 1000 IU heparin as anti-coagulant per 5 ml of blood sample.

Total lipids were determined using the method outlined by Bragdon (1951). Similarly the procedure reported by Zatkis et al. (1953) was used to determine plasma cholesterol; whereas blood glucose levels were estimated by the method of Nelson (1944). For the quantitative analysis of phospholipid content of blood samples, the methods reported by Youngburg and Youngburg (1930) have been employed, which made use of the total phosphorus present in the blood plasma of the subjects under study were calculated by subtracting the values obtained for plasma cholesterol and phospholipids from the total lipid values as recommended by Bragdon (1951).

For urine analysis, morning urine samples of each experimental subject were collected and qualitatively examined for sugar with benedict's reagent, albumin by nitric acid test, specific gravity with urinometer and pH by pH test papers to rule out any pathological condition.

Thus the data pertaining to obese and non-obese regarding total lipids, cholesterol, phospholipids, triglycerides and glucose were compared by randomized group comparison method using test whereas regression coefficients and correlation coefficients were worked out and tested for significance using the statistical methods. Sendecor (1967).

Results and Discussion

Tables I and II show the average blood values in different age groups of obese and normal subjects respectively. The data shows that the values of blood components in obese are much higher than those of non-obese. The average values for total lipids, cholesterol, phospholipids, triglycerides and glucose in the obese were 548, 275, 156, 121 and 99 mg/100 ml respectively as compared to 381, 176, 107, 71 and 72.5 mg/100 ml respectively in normal. The data further indicate that the blood values vary with variation in percent overweight. The average total lipid contents were 540.0, 525.6, and 567.5 mg/100 ml in 10, 15 and 20 percent obesity groups, respectively. The value in 15 percent overweight group decreased while it

was highest in 20 percent overweight group. The levels of triglycerides followed the same pattern as total lipids where as the values of cholesterol and phospholipids increased with the increase in percent overweight (Table III). The glucose level was 85 mg/100 ml in 15 percent which decreased slightly (100 mg/100 ml) in 20 percent overweight subjects.

highly significant correlation ($r=0.56$) with plasma cholesterol. The mean value for plasma cholesterol in the obese being 275 mg/100 ml at an average body weight of 70.3 kgm and the average level of plasma cholesterol in the normal was 176 mg/100 ml against an average weight of 50.0 kgm. These values in obese were significantly higher ($P < 0.01$) than those of normal.

Table I: Average Blood Values of Obese Women

Age Group Years	Average weight (KG)	Total lipids (mg/100 ml)	Cholesterol (mg/100 ml)	Phospholi- pids (mg/100 ml)	Trigly- cerides (mg/100 ml)	Glucose (mg/100 ml)
15-19	63.8	510.80	278.33	155.33	77.66	129.33
20-39	72.6	539.80	283.20	150.00	183.70	92.60
40 and above	84.01	579.10	299.10	176.50	120.70	101.30
Over all average	70.3	548.00	275.00	156.00	121.00	99.00

Table II: Average Blood Values of Normal Women

Age Group Years	Average weight (KG)	Total lipids (mg/100 ml)	Cholesterol (mg/100 ml)	Phospholi- pids (mg/100 ml)	Trigly- cerides (mg/100 ml)	Glucose (mg/100 ml)
15-19	39.7	359.66	160.00	100.00	66.33	77.33
20-39	51.3	389.50	170.30	103.20	67.30	71.00
40 and above	53.4	457.75	191.25	105.25	65.50	74.00
Over all average	50.00	381.00	176.00	107.00	71.00	72.50

Table III: Blood Values According to Overweight Groups

Percent Over Weight (KG)	Total lipids (mg/100 ml)	Cholesterol (mg/100 ml)	Phospholi- pids (mg/100 ml)	Trigly- cerides (mg/100 ml)	Glucose (mg/100 ml)
4.5-6.8	540.09	255.0	146.0	141.5	85.0
7.0-9.0	525.6	269.5	152.4	98.4	104.2
9.1 and above	567.5	285.5	163.0	128.0	100.00

Effect of Weight on Total Plasma Lipids

The results indicate significant correlation ($r=0.29$) between weight and plasma total lipids. The mean value for plasma total lipids in obese (70.3 kgm body weight) being 548 mg/100 ml of plasma, while this value for non-obese (50 kgm body weight) was 381 mg/100 ml of plasma. The difference between obese and normal women was statistically significant ($p < 0.01$). The level of total lipid increased by 1.23 mg/100 ml per kgm increase in weight in the obese, whereas an increase of 1.08 mg total lipid per kgm increase in weight was noted in case of normal women. Thus our results on total blood lipids conformed with those of Person and Sterky (1966) and Gontzea et al. (1970).

Effect of Weight on Plasma Cholesterol

The results show that body weight has a

The increase in cholesterol per kgm increase in body weight in the obese was 1.91 mg/100 ml as against 1.03 mg/100 ml in the normal. These findings are therefore in line with those of Rath et al. (1967) who reported similar significantly higher cholesterol values in the obese than in the normal as did Davidson and Passmore (1967) who concluded that obesity was often associated with elevated levels of cholesterol in the blood plasma. Holister et al. (1967) went a step further to correlate various measurements of body fatness with serum cholesterol and found that 60 percent of the subjects under study had higher cholesterol levels and that the said levels increased with the advancement of age both in obese and normal subjects. These facts have also been confirmed by the present investigation in which abdominal circumference have shown significant correlation with plasma cholesterol.

Effect of Weight on Plasma Phospholipids

The results show a highly significant correlation ($r=0.58$) of weight with phospholipids.

The overall average values of phospholipids for obese and non-obese are 156 and 107 mg/100 ml, respectively. Statistically phospholipid values of obese were found to be significantly higher than those of non-obese, and the increase in the level of phospholipids per kgm increase in body weight of obese came out to be 1.10 mg/100 ml when compared with the increase of 0.57 mg/100 ml of the non-obese.

Effect of Weight on Plasma Triglycerides

A significant correlation ($r=0.33$) has been found between weight and triglycerides of the obese. The average values of triglycerides for obese and non-obese are 121 and 71 mg/100 ml respectively. Highly significant difference was found between the triglyceride values of the obese and non-obese statistically. An increase of triglycerides per kgm gain in body weight in the obese was 154 mg/100 ml, while this value in the normal was 0.77 mg/100 ml. Berkowitz (1964), Hurbert (1972) and Hollister et al. (1967) also reported higher triglyceride levels in obese than in the normal or non obese. Rifkind et al. (1967) estimated serum triglyceride concentrations after an overnight fasting in obese and normal women and reported significantly higher triglycerides in the former group. Triglyceride levels concluded in this investigation therefore further substantiated the findings of the previous researches.

Effect of Weight on Blood Pressure

Weight seemed to have a considerable influence on blood pressure as revealed by the data presented in Table IV. In the obese, blood pressure ranged from 120/180 to 170/120 for different weight groups as compared to 90/60 to 130/90 mm of mercury in the non obese women of comparable body weight.

Table IV: Averages of Blood Pressure in Different Weight Groups of Obese and Normal Subjects

Weight	Obese		Weight (KG)	Normal	
	Blood pressure (mm Hg)			Blood pressure (mm Hg)	
63.8	126/87		39.7	96/68	
72.6	129/86		51.3	113/84	
84.0	145/99		53.4	90/71	

Effect of Age on Blood Component Values

Age had close relationship with total lipids ($r=0.80$), significant correlation with cholesterol ($r=0.28$), and phospholipids ($r=0.31$). With the advancement of age, the level of total lipids rose by 2.35 mg/100 ml every year in the obese subjects as compared to 0.46 mg/100 ml rise in the non obese as evident from the data.

The yearly increase in cholesterol of obese blood was 1.60 mg/100 ml and in the non obese 0.4 mg/100 ml. The rise in the level of phospholipids per 100 ml of plasma per year was 0.73 mg in the obese and 0.07 mg in the normal. Age however exerted no significant effect on triglyceride and blood glucose levels of normal or obese patients.

Effect of Abdominal Circumference on Blood Values

Abdomen circumference gave a highly significant ($r=0.52$) correlation with total plasma lipids. With every inch increase in abdominal circumference of obese the level of total lipids rose by 4.27 mg/100 ml, whereas the rise in the non obese was 1.1 mg/100 ml. Similarly highly significant correlation ($r=0.7$) was found between the abdominal circumference and plasma cholesterol. The rise in the cholesterol level per inch increase in the abdominal circumference was 1.50 mg/100 ml. However the relationship of abdominal circumference with phospholipids and triglycerides was found to be non significant.

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