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A study on the variations in lipid profile of valvular heart disease patients

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ABSTRACT

The present study was conducted to investigate the changes in the lipid profile of valvular heart disease patients. 21 patients of acute or severe valvular heart diseases, both male and female, age group 30 to 75 years, were included in the study. Serum levels of total cholesterol, HDL cholesterol, LDL cholesterol, and triglycerides were analyzed by using biochemical kits and the data obtained by these patients were compared with the data from normal individuals using the students "t" test. It was found that the total cholesterol, HDL cholesterol, LDL cholesterol and triglycerides concentrations were significantly higher ($p < 0.05$) in valvular heart disease patients.

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1. Introduction

The heart valve suffering, known as valvular heart disease (VHD) is a pathological condition interrelated with valves, otherwise pertaining to opening and closing of the heart properly. Such diseased valve may be incompetent to close fully and allows an amount of blood to leak backward. This may also happen due to the stiffened, thickened or fused leaflets causing improper opening of the valve [1]. The valves involved in VHD are aortic and mitral on the left and pulmonary and tricuspid on the right [2].

VHD can develop prior the birth or can be acquired during the life due to some infection, and indeed such acquired VHD are more common. Sometimes, the cause is unknown, but often the change in the structure of valves is a result of mineral deposits, either all over it or its surrounding tissues. In case of infections the valves are affected; such as in rheumatic fever or other infections [3].

VHDs are the most predictable cause of sudden death. For many years, VHD prevalence was believed to be relatively low. However introduction of the echocardiogram has dispelled this belief. Recent studies have indicated a remarkably high proportion of mild to severe VHD in a number of patients [4].

VHD is more prevalent in elders than among the underage people. However its prevalence interrelates with age. It is about

0.7% in 18 to 44 year olds. Whereas 13.3% in the 75 years and onwards. As compared to the rheumatic, the degenerative valve disease has emerged as a major cause of morbidity and mortality in the aging population. Valve diseases thus represent an important public health problem [5].

Importance of lipids

The term cardiovascular disease refers to an abnormal function of the heart or blood vessels [6]. The lipid profile is a group of tests that are often ordered together to determine the risk of heart disease. These tests are good indicators of whether someone is likely to have a heart attack or stroke caused by the blockage of blood vessels or hardening of the arteries. The lipid profile typically includes:

Total cholesterol

High levels of cholesterol in blood circulation are strongly associated with progression of heart disease. For a person of about 68 kg typical total blood cholesterol synthesis is about 1g (1000 mg) per day [7].

High density lipoprotein cholesterol (HDL-C)

It is called good cholesterol, appears to protect atherosclerosis [8].

HDL-C is also believed to inhibit the uptake of LDL-C into arterial wall. It also facilitates the clearance of cholesterol from atheromatous plaque [9].

Low density lipoprotein cholesterol (LDL-C)

Low density lipoprotein is also called bad cholesterol. They are cholesterol rich lipoproteins that result from the breakdown and

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removal of triglycerides from intermediate density lipoproteins [10]. Elevated levels of LDL-C in blood increase the risk of artery and heart disease.

Triglycerides (TG)

Triglycerides are a form of fat in the blood stream; derived from glycerol and fatty acids [11]. TG has several functions; they are an excellent insulation material and form a layer around the body that conserves heat. It converts toxic excess of the sugars required for brain functions [12].

The present VHD study was undertaken with the help of the Head of Cardiac Ward, Civil Government Hospital, Karachi.

2. Materials And Methods

Blood samples of 21 patients of VHD were collected each day from the Civil Government Hospital.

Blood sampling

Blood sample drawn from the cubital vein of the arm of each patient by a 5cc disposable syringe, was soon transferred to a heparinized collecting tube and finally preserved into an ice pot. All these tubes were then transferred to a test tube stand, were allowed to stand overnight for the serum to separate. Then each serum sample was transferred to a separate eppendorf tube and stored at 4°C in a refrigerator.

Biochemical Estimation (Remarks)

For a long time, clinical investigation was limited to the measurement of the lipids. More recently, the classification of lipoproteins is based on changes in the concentration of disorders of one or other fractions. In research laboratories, measuring of lipoprotein is preferred through ultracentrifugation. However this procedure is not suitable for a routine analysis in hospital laboratories [13].

Methods of Estimation

Cholesterol was estimated by enzymatic colorimeter test [14]. Estimation of HDL-C was done through phosphotungstic precipitation and LDL-C was also done through the same precipitation method [15]. Estimation of Triglycerides (TG) was done by enzymatic colorimetric test [16].

Serum of 21 normal and 21 VHD patients, used for individual determinations of lipid profile for Cholesterol, HDL-C, LDL-C, and TG by using clinical laboratory kits. The absorbance of samples were read on spectrophotometer and the collected data was analyzed statistically by t-test.

3. Results

Cholesterol

A consideration of Table 1, indicates that the minimum serum cholesterol value of 21 normal individuals is 54.6 mg/dl and the

maximum serum cholesterol is 181 mg/dl. Whereas, the minimum serum cholesterol of 21 VHD group is 147.65 mg/dl and the maximum is 206.14 mg/dl.

As compared with the minimum value of normal individual, the serum cholesterol value of VHD patients is 3-times higher and the highest VHD value of 206.14 mg/dl is again 25.14 mg/dl higher than the serum cholesterol of normal subjects. The statistical analysis showed a significant difference ($P < 0.05$).

TABLE 1. Serum cholesterol concentrations (mg/dl) of normal individuals and VHD patients.

Normal Individuals	VHD Patients
54.6	147.65
62.6	173.21
75.4	174.51
77.3	147.70
84.1	175.44
86.3	176.37
86.9	177.86
98.7	180.84
105.1	184.56
108.8	184.56
113	185.12
126.4	186.42
129	187.6
139.2	188.6
147.1	193.7
157.23	195.07
163.2	195.53
167	197.58
168	199.25
174.4	199.26
181	206.14

HDL - C

Interestingly, the normal least concentration of HDL-C is 42.0 mg/dl as compared to 39 mg/dl of VHDs. The maximum HDL-C of normal 21 individuals is 104.5 mg/dl as compared to 44.63 of VHD (Table 2).

In normal individuals, HDL-C ranged from 42.0 - 104.5 mg/dl and the difference is 62.5 mg/dl, whereas, in VHD patients, the HDL-C range was very low. It was 39.0 - 44.63 mg/dl and the difference between the 21 VHD patients was 5.63 mg/dl. The statistical analysis indicated a significant difference ($P < 0.05$).

TABLE 2. Serum HDL-Cholesterol concentrations (mg/dl) of normal individuals and VHD patients.

Normal Individuals	VHD Patients
42	39
49	41.26
49.5	41.55
52.4	41.61
55	41.89
56	41.91
56.2	42.27
59.3	42.27
65.4	42.65
65.7	42.69
75.7	42.81
77.2	42.93
77.8	43.09
80	43.18
87.4	43.26
88	43.46
92	43.91
92.4	43.95
96	43.98
102	44.16
104.5	44.63

LDL - C

Table 3 shows that the serum LDL-C of 21 healthy individuals varies between 54.4 – 124.0 mg/dl, whereas, in case of VHD it ranged from 74.07 - 121.58 mg/dl, showed high minimum and high maximum LDL-C concentrations. Here again the statistical difference is significant ($P < 0.05$).

TABLE 3. Serum LDL-Cholesterol concentrations (mg/dl) of normal individuals and VHD patients.

Normal Individuals	VHD Patients
54.4	74.07
56.8	92.27
64.3	94.0
66.5	94.45
67	97.06
67	97.14
71.8	100.34
72.6	100.49
74.7	103.79
84.3	104.21
87	105.27
89	106.33
95.5	107.81
96.2	108.03
98.23	109.03
105	115.2
112.3	115.14
114	115.83
117	117.17
123.4	117.44
124	121.58

TG

A consideration of Table 4 indicates the minimum serum TG concentration in the normal 21 healthy individuals was 57.2 mg/dl and the maximum value was 132.6 mg/dl and the difference between minimum and maximum values was 75.4 mg/dl. The minimum TG concentration among the VHD patients was 165.27 mg/dl and the highest value among the VHD was 267.78 mg/dl. The difference between the highest and lowest TG concentration in VHD group was 102.51 mg/dl. Again when compared with minimum concentration of TG value of the normal individuals, in the VHD value is 3- times higher and again when compared with the maximum TG concentration of normal individuals, the maximum value of VHD is 135.18 mg/dl high. However, the statistical analysis showed a significant difference ($P < 0.05$).

TABLE 4. Serum Triglyceride concentrations (mg/dl) of normal individuals and VHD patients.

Normal Individuals	VHD Patients
57.2	165.27
66.4	166.53
67	170.08
72	171.15
74.6	171.18
76.3	176.15
77.6	176.31
82.6	177.62
84.5	179.92
85.3	182.43
91	182.43
95.8	186.61
98.5	188.28
102	188.28
102.6	190.38
104	190.59
109.2	192.66
116.3	197.6
122.3	204.78
127.1	250
132.6	267.78

4. Discussion

Cholesterol is present in low concentration not only with chylomicrons linked high density lipoproteins (HDL). It is present in moderate concentration with very low density lipoproteins (VLDL). Main cholesterol is present in increased concentration along intermediate density lipoprotein (IDL); as well as with low density lipoprotein (LDL).

Table -1 indicates the individual values of normal group from as low a value as 54.6 mg/dl to as high as 157.23 mg/dl reflecting the variance in concentration of cholesterol as an index of the variety and amount of individual diet since it is obtained from food laden with lipids. On the other hand the comparable data obtained from VHD patients ranged between 147.5 mg/dl to 206.14 mg/dl is the index of nature and state of illness. Therefore the amount of cholesterol obtained of any VHD patient assists with certainly in the diagnosis of the stage of disease.

The acceptable maximum amount of cholesterol for healthy persons is 200 mg/dl; while 180 mg/dl is desirable for healthy persons. Therefore normal individuals with 170 mg/dl to 180 mg/dl can be regarded under the risk (Table -1).

HDL are responsible for reverse cholesterol transport. HDL are synthesized in liver and small intestine, revert cholesterol for break down from peripheral tissues to liver thus protects against atherosclerosis [8,10].

In controls, serum HDL values are higher than that of their VHD counterparts. It is 42 mg/dl to 104.5 mg/dl in controls whereas Table -2 indicates the HDL values of VHD patients ranged from 39 mg/dl to 44.63 mg/dl.

LDL or bad cholesterol, results by break down of triglycerides of intermediate density lipoproteins [8,10].

The control serum LDL values (Table -3) remained between 54.4 mg/dl to 124 mg/dl. Whereas, the serum LDL values of VHD individuals showed a range of 74.07 mg/dl to 121.58 mg/dl, indicating that the values remained within the safety limit of 150 mg/dl. This indicates the VHD values are controlled values of patients under treatment and medications.

As a matter of hard and fast rule, high amount of TG in blood have been related to atherosclerosis. The excess of TG in the plasma leads to hypertriglyceridemia. Cholesterol leads to increase in TG levels and this is especially indicative of this interrelation in the case of TG levels of VHD patients only (Table-4); when cholesterol value of each patient is compared with his TG. For example 147.65 mg/dl cholesterol maintained 165.27 mg/dl TG in patient 1 and 206.14 mg/dl cholesterol maintained 267.78 mg/dl TG in patient 21 (Table -1,4). But the cholesterol value of 54.6 mg/dl of the 1st control is compared with its comparable value of 57.2 mg/dl TG, shows no increase (Table -1,4). Indeed it can be assumed that only and only the increase of cholesterol in the blood of VHD patients increases TG levels (Table -1,4). Therefore, desirable TG levels should remain between 50 – 150 mg/dl.

5. Conclusion

It was found that VHD patients in comparison to normal individuals have significantly higher concentrations of total cholesterol, LDL - C and triglycerides whereas significantly lower levels of HDL - C.

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