LIPID PATTERN IN CHOLELITHIASIS

Talat J. Hassan, Rashida Maqsood, Sarwar J. Zuberi

Abstract

A significant elevation was observed in the serum triglyceride and cholesterol levels in patients with cholelithiasis while those of phospholipids were normal.

A direct relationship was observed between serum triglycerides and hepatic bile cholesterol and an inverse relationship between serum and gall bladder bile cholesterol. Low cholesterol levels found in the gall bladder bile may be due to its precipitation around an infected nidus. Cholesterol was the major constituent of stone being 65mg% of the stone powder (JPMA 29:92, 1979).

Introduction

Major lipids (cholesterol, phospholipids and triglycerides) are known to be involved in gall stone formation. Therefore lipid values in serum, bile and gall stones were determined in patients with cholelithiasis.

Material & Method

Fasting serum lipids (total lipids, cholesterol, triglycerides, phospholipids) were estimated

Table I: Serum Lipid Values in Controls and Patients with Cholelithiasis

Investigations	*Controls* Mean ± S.E. (Range)	*Patients* Mean ± S.E. (Range)	*P. Value*
Total lipids	579 ± 19.0	715 ± 19.0	<.001
Cholesterol	205 ± 8.3 (130 — 300)	238 ± 6.0 (145 — 390)	>.01 <.001
Phospholipids	167 ± 7.2 (100 — 250)	160 ± 5.0 (80 — 250)	Insignificant
Triglycerides	90.5 ± 10.4 (20 — 230)	194 ± 9.8 (30 — 300)	<.001

All values are expressed as mg/100ml.

Table II: Lipids in Hepatic and Gallbladder Bile

Investigations	*Gallbladder bile* (30) Mean ± S.E. (Range)	*Hepatic bile* (29) Mean ± S.E. (Range)
Total lipids	117.76 ± 7.26 (40 — 260)	144 ± 10.42 (60 — 280)
Cholesterol	8.14 ± 0.31 (2.5 — 13.5)	9.25 ± 0.58 (3 — 13.5)
Phospholipids	17.9 ± 0.8 (1.4 — 26)	16.47 ± 0.67 (10 — 24)
Triglycerides	1.26 ± 0.09 (0 — 2.5)	0.97 ± 0.15 (0.3 — 3)

All values are expressed as mg/ml of bile.

Table III: Lipid Contents of Gall Stones

Investigations	*Total No.*	*Mean ± S.E.*	*Range*
Total lipids	38	85.1 ± 1.89	50 — 100
Cholesterol	38	65.1 ± 3.23	10 — 92
Triglycerides	38	1.25 ± 0.11	0 — 2.8
Phospholipids	38	0	0

All values are expressed as mg/100 mg of stone powder

PMRC Research Centre, Jinnah Postgraduate Medical Centre, Karachi-35.

Figure 1.

GALL-BLADDER BILE / SERUM CHOLESTEROL.

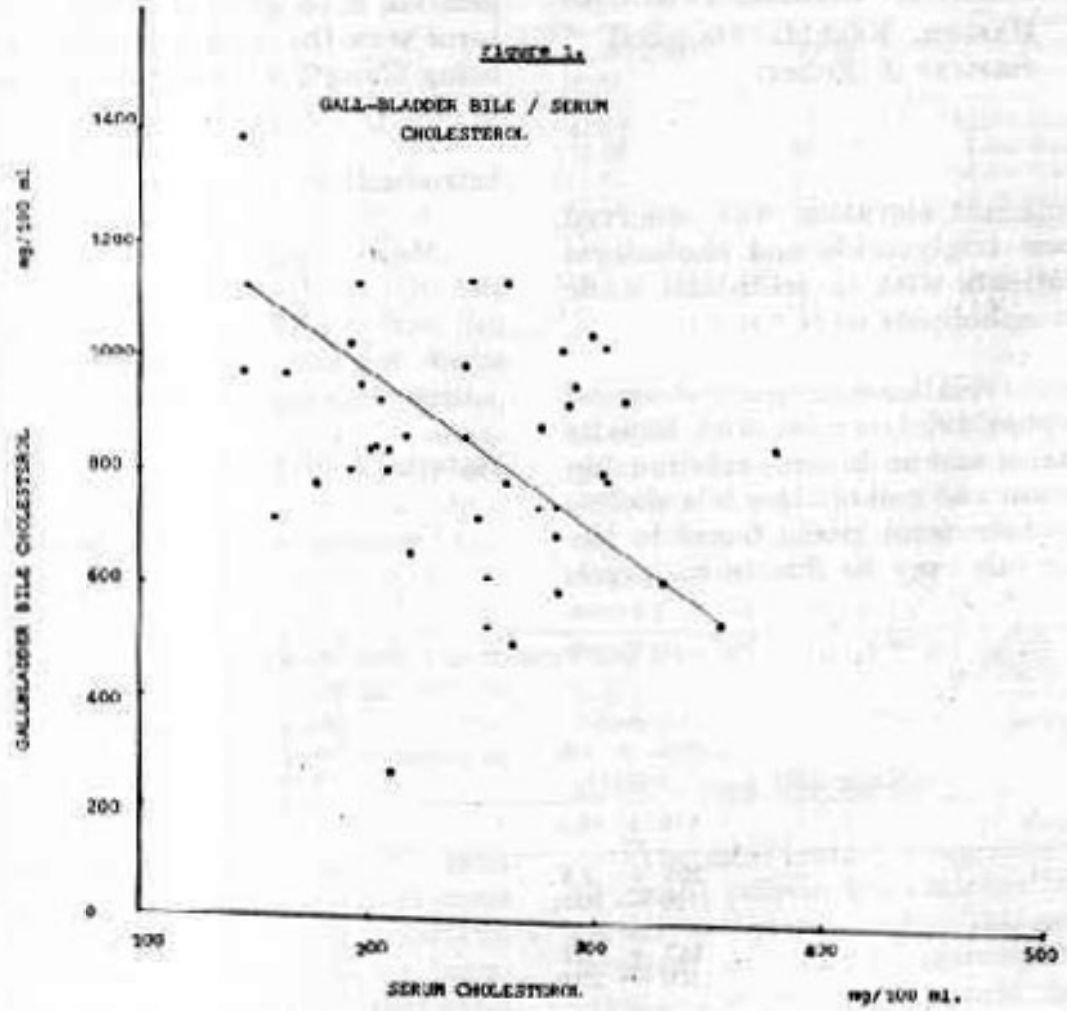
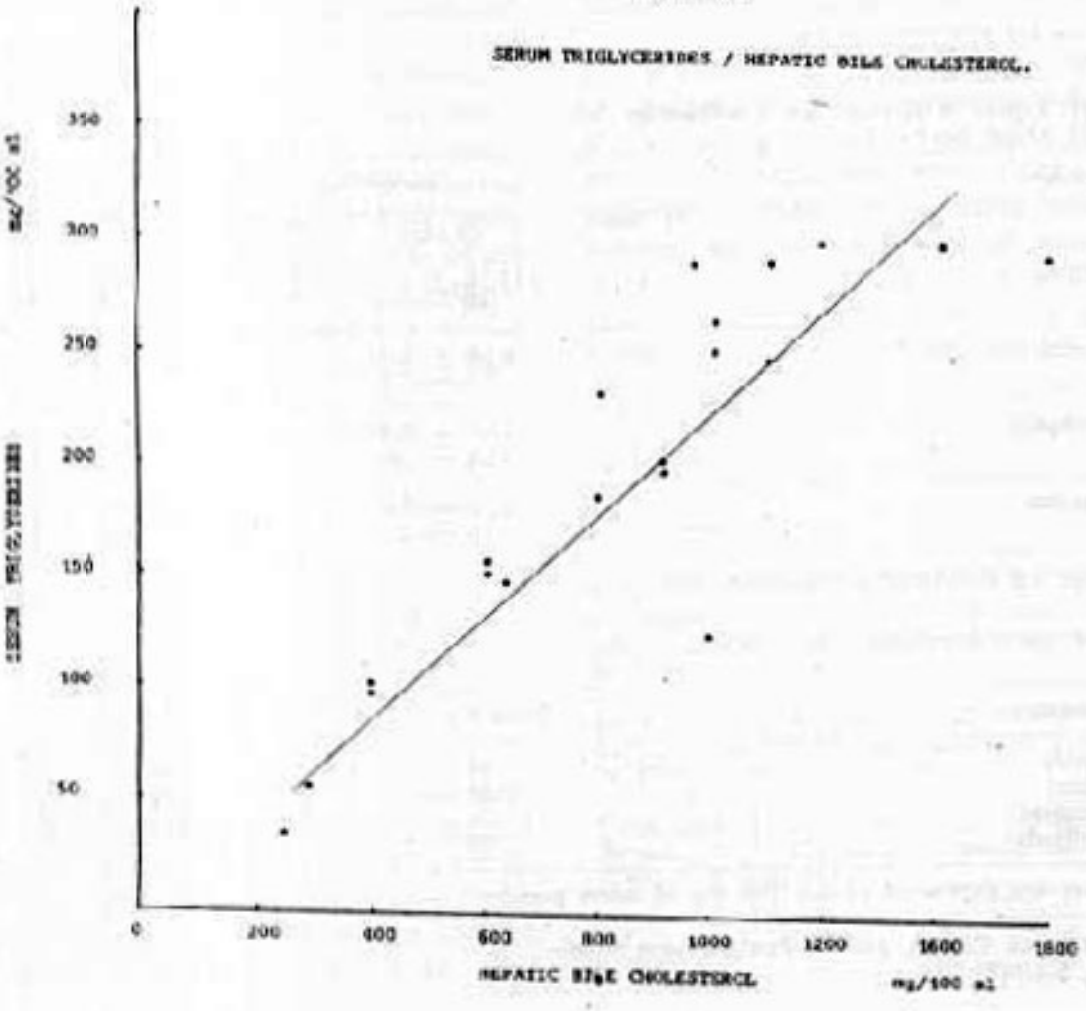


Figure 2.

SERUM TRIGLYCERIDES / HEPATIC BILE CHOLESTEROL.



in 55 patients preoperatively and in 30 control subjects.

Gall bladder and hepatic bile were collected at operation in 50 and 29 cases respectively.

All samples of serum, bile and gall stones (after washing and drying) were stored at —20°C before analysis.

Before chemical analysis bile samples were agitated at room temperature and lipids were extracted with organic solvent system (chloroform: methanol 2:1 V/V). Stones were crushed into fine powder and lipids were extracted with the same solvent system.

Cholesterol was estimated by the method of Ferro and Ham (1960), phospholipid by the method of Fiske and Subarrow (1925), total lipids using the method of Kunkel et al. (1948) and triglyceride using the commercial kit method (1974).

Further separation of phospholipids (Lecithin) was done in the sera of 40 patients and the same number of controls and in 40 samples of gall bladder bile by thin layer chromatography (Ali and Kuksis, 1967).

Results

Table I shows serum lipid values in patients and controls. Statistically significant elevation in total serum lipids, triglycerides and cholesterol was observed in patients when compared to controls. There was no significant difference in phospholipid values in two groups.

Of the total phospholipids, Lecithin was 50.0 mg/100ml of serum in patients (range 29.5 - 93 mg%) and 50.5 mg/100 ml of serum in controls (range 33.3 - 99 mg%).

The lipid content of 29 hepatic and 50 gall bladder bile specimens collected at operation is shown in table II. Slight elevation in cholesterol levels was observed in hepatic bile.

Table III shows the results of lipid analysis of gall stones. Cholesterol was the major constituent i.e., 65 mg% of the stone powder.

An inverse relationship was observed between the serum and gall bladder bile cholesterol (Fig I) and a direct relationship between levels of serum triglycerides and hepatic bile cholesterol (Fig. 2).

Discussion

The elevation of the levels of total serum lipids, triglycerides and cholesterol observed in patients with cholelithiasis in this series were statistically significant when compared with those of controls.

Liver is the source of both blood and biliary lipids. Serum triglyceride levels reflect the rate at which the liver synthesizes and secretes cholesterol into the bile. The increased secretion of triglycerides will therefore increase the biliary secretion of cholesterol (Sodhi and Kudchodkar, 1973; Bell et al., 1973). A direct relationship was observed between serum triglycerides and hepatic bile cholesterol and the cholesterol content of stone powder was 65 mg% in this study.

Raised serum cholesterol is known to be associated with increased incidence of gall stones as seen in American Indians (Grundy et al., 1972). A significant ($P < .001$) rise in serum cholesterol was also seen in our patients with cholelithiasis.

Phospholipids are important for solubiliz-

Table IV: Geographical Differences in Gallbladder Bile Composition

Name of the country	*No. of specimens*	*Total lipids Mean ± S.E.* (Range)	*Cholesterol Mean ± S.E.* (Range)	*Phospholipids Mean ± S.E.* (Range)	*Triglycerides Mean ± S.E.* (Range)	*P.C. ratio*
Sweden Nakayama et. al. (1971)	19	150.6 (30.6 — 240.5)	10.8 (1.4 — 21.8)	34.0 (5.5 — 67.5)	0	3.7
Japan Nakayama et. al. (1971)	20	118.0	5.5	28.1	0	6.0
Pakistan (1977) (Present series	50	117.7 ± 7.3 (40 — 260)	8 ± 0.3 (5 — 28)	17.9 ± 0.8 (1.4 — 26)	1.26 ± 0.09 (0 — 2.5)	2.2

Note: All values are expressed as mg/ml of bile.

ing cholesterol (Northfield and Hoffman, 1973). cholelithiasis is infrequent in Zambians who usually have high plasma phospholipids (Lewis 1973). Levels of biliary phospholipids which are synthesized from plasma phospholipids were lower in our patients than those reported by Nakayama and Linden (1971) in Japanese and Swedish subjects. The phospholipid: cholesterol (P:C) ratio in this series was 2.2 (Table IV).

The incidence of cholelithiasis in Japan with a P:C ratio of 6.0 was found to be 3.5% and in Sweden where the P:C ratio was 3.7 the incidence increased to 10-15% (Nakayama and Linden, 1971). With a P:C ratio of 2.2 in this study it is expected that the incidence of cholelithiasis will be even higher in Pakistan than in Sweden.

The dietary history obtained in 62 subjects revealed an excessive consumption of carbohydrate and saturated fat and a low intake of protein. Whether this dietary pattern in susceptible individuals affects the levels of serum cholesterol, triglycerides and phospholipids and leads to biliary lithogenesis needs further studies.

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