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Relationship between gallstone disease and serum lipids in normal adult Nigerians

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ABSTRACT: Gallstone disease (GSD) is one of the commonest gastrointestinal diseases seen in clinical practice. Cholesterol and triglycerides are established principal constituents of the majority of gallstones, particularly in the Western world. This study was, therefore, embarked upon to examine the relationship between gallstone disease and serum lipids.

One hundred normal adult Nigerians (50 males and 50 females) underwent real time ultrasonography (USS) to determine the relationship between serum lipids (cholesterol and triglycerides) and gallstone disease. Demographic characteristics and serum lipids were determined for each of those enrolled. Longitudinal and transverse scans of the right upper quadrant (RUQ) was done in both the supine and left lateral positions.

The USS examinations were done in the morning following an overnight fast (to prevent gallbladder contraction) without sedation. USS findings were considered positive for the presence of gallstone disease only in those in whom reproducible echogenic masses with possible acoustic shadows were seen. Patients with known risk factors for hyperlipidaemia were excluded from the study. The body mass index (BMI) and waist hip ratio (WHR) were determined for each patient.

Seven (4 males and 3 females) had USS evidence of gallstone disease. The body mass index for the individuals ranged from 14.7 to 34.5 kg/m² with a mean of 23.5 ± 5.4 kg/m². The WHR ranged from 0.81 – 1.19 with a mean of 0.95 ± 0.07. The mean serum cholesterol of the individuals with gallstone disease was 4.1 ± 1.2 mmol/L compared with 3.9 ± 0.2 mmol/L in those without gallstone disease (P > 0.05). The mean serum triglycerides of individuals with gallstone disease was 1.2 ± 0.6 mmol/L compared with 0.9 ± 0.1 mmol/L in those without gallstone disease (P > 0.05).

These findings suggest that the mean serum lipids (cholesterol and triglycerides) of individuals with gallstone disease tended to be higher than those without gallstone disease but the difference is of no statistical significance.

Key Words: Gallstone disease; Serum lipids; Cholesterol; Triglycerides.

Introduction

Gallstone disease (GSD) is one of the most common gastrointestinal diseases seen in clinical practice. Most patients with this disease are asymptomatic (1). The chief constituents of gallstones are cholesterol, bilirubin and calcium (2). Other constituents may include fatty acids, triglycerides, protein and polysaccharides. In the great majority of stones encountered in the Western world, the principal constituent is cholesterol, which usually comprises 70 to 98 per cent of the dried substance of the stone (3).

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Gallstone can be classified, based on analysis of its constituents by infrared spectroscopy (4) into the following:

- (i) Pure GS of cholesterol or calcium bilirubinate (pigment stones)
- (ii) Mixed GS (cholesterol, calcium bilirubinate, calcium carbonate) composed chiefly of two or all three of the components.
- (iii) A combination of stones with a nucleus of one type and a shell of another substance (4).

The pathogenic mechanism(s) by which GS forms is generally agreed to be due to (i) alteration in the composition of bile, (ii) stasis and (iii) infection (5,6). The risk factors for cholesterol GS include increasing age, female gender, multiparity, obesity, rapid weight loss, high animal fat diet, drugs such as contraceptive pills and ileal disease or resection. Others are liver cirrhosis, haemoglobinopathy and diabetes mellitus (7).

Cholesterol gallstones are formed when excess cholesterol precipitates from bile supersaturated with cholesterol. Either the gall bladder (through alteration of the composition of normal hepatic bile) or the liver (through production of an abnormal bile) could be the source of the bile supersaturated by cholesterol (8).

Materials and Methods

The study was a prospective one. The setting of the study was the Medical Out-Patient Department (MOPD) of the University of Ilorin Teaching Hospital (UITH), Ilorin, Nigeria. Approval for the study was obtained from the Research and Ethical Committee of the UITH. Verbal and informed consent was obtained from the participants.

One hundred adult Nigerians (50 males and 50 females) underwent real time ultrasonography (USS) using real time ultrasound scanner from Sony Incorporated, Japan. Their demographic characteristics and biochemical parameters (including serum lipids) were recorded and compared.

The subjects were recruited from normal hospital health workers, patients with minor ailments such as malaria and upper respiratory tract infections (URTI). Only patients with haemoglobin genotype Hb AA were recruited into the study. The examinations were done in the morning following an overnight fast (to prevent gall bladder contraction) without sedation.

Longitudinal and transverse scans of the right upper quadrant (RUQ) was done in both the supine and left lateral positions. USS findings were considered positive for the presence of GSD only in those for whom reproducible echogenic masses with possible acoustic shadows were seen. Patients with known risk factors for GSD, such as haemolytic disorders like sickle cell disease and pregnancy, were excluded. Patients who have had cholecystectomy were also excluded. Biochemical tests (such as estimation of serum cholesterol and triglycerides) were performed using 10 ml of blood in bottles containing lithium heparin.

Statistical Analysis

The data obtained were analysed with Epi-Info statistical software, version 6.1.

Results

All the 100 patients completed the study. Their ages ranged between 25 and 75 years with a mean of 49.0 ± 12.5 years. The Body Mass Index (BMI) ranged from 14.7 kg/m^2 to 34.5 kg/m^2 with a mean of $23.5 \pm 5.4 \text{ kg/m}^2$. The mean BMI was within the normal range ($18.5 - 24.9 \text{ kg/m}^2$).

The Waist Hip Ratio (WHR) ranged from 0.81 to 1.19 with a mean of 0.95 ± 0.07 . Seventy-nine (79%) of the patients fell within the age group 40 – 69 years. Four patients (57.1%) in the study group with GS

were in the age group 40 – 59 years. The peak incidence (57.1%) was also in the age group 40 – 59 years, i.e the fifth and sixth decades, with a steady decline towards the eighth decade, i.e 70 – 79 years (14.3%).

In the group with GS, three of the patients were males (42.9%) while four were females (57.1%) giving a male to female ratio of 1:1.3. The difference is, however, not statistically significant ($P = 0.198$). The demographic and anthropometric data are summarised in Table 1. Table 2 also shows the age distribution of patients with gallstones.

Table 1: Demographic and anthropometric data of the study subjects (n = 100).

Variables	Range	Mean \pm SD
Age (Years)	20 – 75	49.0 \pm 12.5
BMI (kg/m ²)	14.7 – 34.5	23.5 \pm 5.4
WHR	0.81 – 1.19	0.95 \pm 0.07

Table 2: Age distribution of patients with gallstones.

Age Group (Years)	Subjects		
	No. in Group	No. with GS	% With GS
20 – 29	1	0	0
30 – 39	12	1	14.3
40 – 49	26	2	28.6
50 – 59	28	2	28.6
60 – 69	25	1	14.3
70 -79	8	1	14.3
Total	100	7	100

Prevalence of cholelithiasis in the study population

Seven patients had GS. This gives a prevalence of 7% in the study population. The mean serum levels of cholesterol were higher in the patients with GS than in those without, 4.1 \pm 1.2 mmol/L and 3.9 \pm 0.2 mmol/L respectively. The difference was, however, not statistically significant ($P > 0.05$). Similarly, the mean serum levels of triglycerides were higher in patients with GS than in those without, 1.2 \pm 0.6 and 0.9 \pm 0.1 mmol/L. The difference was also not statistically significant ($P > 0.05$) (Table 3).

Table 3: Relationship between gallstones and serum lipids.

Lipids	Subjects with GS	Subjects without GS	P-value
Serum cholesterol (mmol/L)	4.1 \pm 1.2	3.9 \pm 0.2	0.747 (NS)
Serum triglycerides (mmol/L)	1.2 \pm 0.6	0.9 \pm 0.1	0.862 (NS)

NS – Not statistically significant.

Discussion

Reports in the literature have shown that the prevalence of cholelithiasis is very low in most parts of Africa, compared to the countries in the Western world (7, 9 – 12). Gallstones are present in 10 – 20 per cent of the population in Western countries, but the exact prevalence is unknown (7). This value is much higher than the 0.18 to 0.8 per cent reported for the general population in Nigeria (10, 12). The difference in the prevalence of cholelithiasis might be due to racial factors, geographical locations and differences in lifestyles as this disease appears to affect mainly Western civilization (9).

The mean serum levels of cholesterol and triglycerides were consistently higher in patients with GS than in those without GS, although the differences were of no statistical significance. Chapma et al. (13) found a positive association between GSD and serum triglycerides, LDL cholesterol and decreased HDL cholesterol. Chen et al. (14) also found a positive association between GSD and decreased HDL cholesterol levels. Devesa et al. (15) have reported a positive association between GS and serum triglycerides in Spanish men. However, Lu et al (16) could not establish an association between hyperlipidemia and GSD in the Chinese population in Taiwan.

There are no reports in the literature of any studies comparing the relationship between gallstones and serum lipids in an African population. The data presented here, therefore, serve to establish a baseline for such studies.

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