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Original Article

Anatomy Section

Correlation of Gallstone Characteristics with the Clinical Parameters in Cases of Cholelithiasis

HEMLATA SHARMA, GHANSHYAM GUPTA, MANOJ KUMAR SHARMA

ABSTRACT

Introduction: Cholelithiasis means the "presence of stone in the gall bladder" is a common clinical entity affecting the adult population of both sexes. Various sign and symptoms like severe pain in Murphy's point in right upper quadrant of abdomen, bilious vomiting, mild to moderate increase in temperature, obstructive jaundice, loss of appetite and weight are present in cholelithiasis. Gallstones are known to produce diverse histopathological changes in the gall bladder.

Aims: The study was undertaken to assess prospectively the influence of physical, clinical and biochemical characteristics on type of gallstones and their relationship in patients of cholelithiasis.

Materials and Methods: The study was done in hundred patients of cholelithiasis of both sexes, aged between 12 years to 80 years who underwent cholecystectomy. The stones were assessed for various parameters i.e. number, size, morphological types and correlated with clinical Indices of cases (Haemoglobin, TLC, DLC, Blood sugar, SGOT, SGPT, Alkaline phosphatase, total serum bilirubin, direct serum bilirubin, Indirect serum bilirubin , total serum protein and albumin values) and also with diabetes mellitus ,smoking, tobacco chewing, alcohol intake and dietary habits of cases of cholelithiasis.

Results: Out of total 100 specimens examined in present study, 24 had cholesterol (male-4, female-20), 46 had mixed (male-11, female-35) and 30 had pigmented (male-11, female-19) gallstones respectively. Number of stones varies from a single calculus in 30% cases, double in 12% cases and multiple in remaining 58% of cases. Shape of stone varied from polygonal/rectangular in 1% cases, ovoid in 15%, rounded in 22%, irregular in 29% and maximum had faceted shaped gallstone in 32% of cases.
Haemoglobin, TLC, DLC, Blood sugar, SGOT, SGPT, Alkaline phosphatase, total serum bilirubin, direct serum bilirubin, Indirect serum bilirubin, total serum protein and albumin values did not showed statistically significant correlation with gallstone types. The mean systolic BP ($p<0.27$) and the mean diastolic BP ($p<0.012$) in patients having cholesterol, mixed and pigmented gallstones showed statistically significant association with gallstone types.

Conclusion: Mixed gallstones more common among females and association of biochemical indices needs further exploration. Therefore gender, ethnicity and other clinical features can be used as the factor to predict the formation of gallstones disease. It is also recommended that all patients should go through the analysis of all the biochemical parameters before cholecystectomy.

Keywords: Black pigment, Cholecystitis, Cholesterol stone, Gall bladder, Gallstone disease, Mixed stone

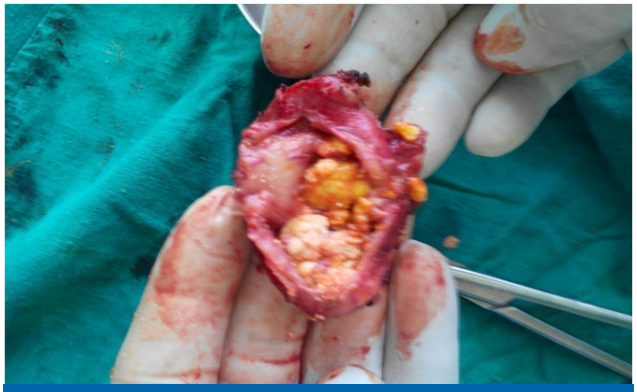
INTRODUCTION

The gall bladder is stimulated to contract and expel the bile in to the duodenum by the hormone Cholecystokinin Pancreozymin (CCK) produced by the endocrine cells of the duodenal mucosa in response to food (Norman S. Williums, Bailey and Loves, 25th edition) [1]. The inner surface of bladder is covered by mucosa with simple columnar epithelium with microvilli, Muscularis mucosa and submucosa are absent in gall bladder. Mucus glands are only present in the neck region of gall bladder [2].

Cholelithiasis has been described as a disease of civilization. It is observed in Egyptian mummies dating as far back as 3400 B.C. It appears likely that Charaka (2nd century B.C.) and Sushruta (6th Century B.C.) from India were also familiar with this disease of the biliary tract [3,4].The severity of gallstone disease has previously been shown to related to gallstone type and particularly septic complications are much more common in patients with pigment gallstones than in patients with cholesterol gallstones [5,6].

Various sign and symptoms like severe pain in Murphy's point in right upper quadrant of abdomen, bilious vomiting, mild to moderate increase in temperature, obstructive jaundice, loss of appetite and weight are present in cholelithiasis [7].

Cholecystitis and cholelithiasis are very common particularly in fatty, fertile and female in 40. Gallstones are a major cause of morbidity and mortality throughout the world. The prevalence



[Table/Fig-1]: Showing double cholesterol yellowish stone in distended gall bladder

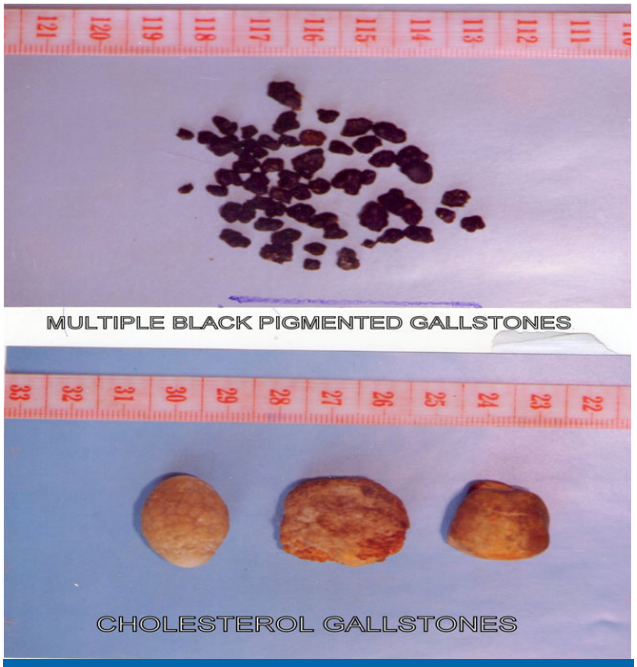
varies with age, sex and ethnic group. Most people are unaware of the disease and remain asymptomatic for whole life [7].

Three types of stones are identified [8] as –

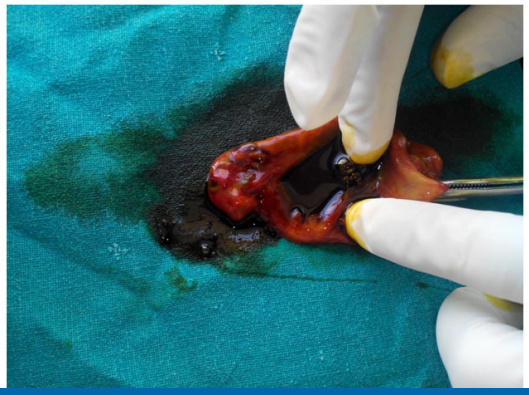
(a) Cholesterol stone- Radiolucent light yellow to dark green colour stone, 2 to 3 cm in length and oval shaped. They are more likely to respond to non surgical management than pigment or mixed stones [Table/Fig-1,2].

(b) Pigment stone- They are formed by the crystallization of calcium bilirubinate, black and brown coloured, usually multiple, small and hard in consistency associated with infection in the gall bladder, commonly found in Asian descent [Table/Fig-3].

(c) Mixed stone- Radiographically visible, commonest type formed by calcium carbonate, palmitate phosphate, bilirubin



[Table/Fig-2]: Showing multiple black pigmented gallstones and cholesterol gallstones



[Table/Fig-3]: Showing black pigmented gallstones

[Table/Fig-4]: Showing multiple mixed faceted gallstones (Brownish)

and other bile pigments [Table/Fig-4,5].

Gallstone disease is a common problem worldwide including India. It is commonly believed that bile stasis is the prime factor for formation of gall stone [9]. The function of gall bladder not only to store bile but also to concentrate it during the inter digestive phase by means of self dependent water re absorption. Risk factors for gall stone formation are [10]. –

1 Advancing age
2 Sex- prevalence rate of cholelithiasis is higher in women of all age groups.
3 High fat diet.
4 Genetics.
5 Bariatric surgery.

Cholelithiesis produces diverse histopathological changes in gall bladder mucosa namely acute inflammation, glandular hyperplasia, granulomatous inflammation, cholesterosis, dysplasia and carcinoma [11].

AIMS AND OBJECTIVES

The present study was undertaken to correlate various gallstone characteristics (number, size, and morphological

[Table/Fig-5]: Showing multiple mixed faceted gallstones (greenish)

types,) with clinical indices of cases (Haemoglobin, TLC, DLC, Blood sugar, SGOT, SGPT, Alkaline phosphatase , total serum bilirubin, direct serum bilirubin, Indirect serum bilirubin , total serum protein and albumin values) and also with diabetes mellitus, smoking, tobacco chewing, alcohol intake and dietary habits.

MATERIALS AND METHODS

Gall bladder of 100 patients (Male – 26, Female – 74) aged between 12 years to 80 years were obtained from Department of General Surgery, R.N.T Medical College and attached M.B. Government Hospital, Udaipur, Rajasthan, India who underwent cholecystectomy for gallstone disease with chronic cholecystitis after due approval of research project by Institutional Ethical Committee .

Physical characteristics of stones were noted as per the following parameters:

Type : Based on morphology

Number: Single/double/ multiple.

Size: Average of two major diameters with a Vernier caliper (accuracy: 0.01 cm). In the event of multiple stones, the diameter of largest and smallest stone were recorded.

Statistical analysis was performed by using Chi-square test for tables and proportions.

RESULTS

Out of total 100 specimens examined in present study, 24 had cholesterol (male-4, female-20), 46 had mixed (male-11, female-35) and 30 had pigmented (male-11, female-19) gallstones. Number of stones varies from a single calculus in 30% cases, double in 12%cases and multiple in remaining 58% cases. Shape of stone varied from polygonal/rectangular in 1% cases, ovoid in 15%, rounded in 22%, irregular in 29% and maximum had faceted shaped gallstone in 32% of cases. The average weight of patients having cholesterol stone was 63.500 kg, with mixed stone 65.93 kg ,and with pigmented stone 62.76 kg and association of weight with types of gallstones was statically not significant (p>0.3666) [Table/Fig-6].

Clinical and biochemical correlations

The incidence of diabetes mellitus (9%), smoking (7%), tobacco chewing (11%), alcohol intake (10%) and dietary habits (veg. - 66%, mix. - 34%) were noted at the time of admission of patients for cholecystectomy. No statistical association observed between the types of gallstones and above mentioned clinical features [Table/Fig-7,8].

S. No	Type of stone	Age	Weight	Sex (Male)	Sex (Female)
1	Cholesterol	42.12	65.50	4 (16.7%)	20 (83.3%)
2	Mixed	45.76	65.93	11 (23.9%)	35 (76.1%)
3	Pigmented	39.43	62.76	11 (36.7%)	19 (63.3%)
4	f-value	1.908	1.015	2.2965	2.2965
5	p-value	0.154 Not Significant	0.3666 Not Significant	0.227 Not Significant	0.227 Not Significant

[Table/Fig-6]: Association of age, sex and weight of patients with gallstones type

Gallstone type	Alcohol intake		Total	Dietary habits		Total
	No	Yes		Veg	Mix	
Cholesterol	22	2	24	17	7	24
	91.7%	8.3%	100.0%	70.8%	29.2%	100.0%
Mixed	41	5	46	30	16	46
	89.1%	10.9%	100.0%	65.2%	34.8%	100.0%
Pigmented	27	3	30	19	11	30
	90.0%	10.0%	100.0%	63.3%	36.7%	100.0%
	90	10	100	66	34	100
	90.0%	10.0%	100.0%	66.0%	34.0%	100.0%

[Table/Fig-7]: Association of alcohol intake and diet in cases with gallstones type

Haemoglobin, TLC, DLC, Blood sugar, SGOT, SGPT, Alkaline phosphatase, total serum bilirubin, direct serum bilirubin, Indirect serum bilirubin, total serum protein and albumin values are shown in [Table/Fig-9]. No significant correlation between the gallstone type and biochemical values were detected in present study [Table/Fig-9].

The mean systolic BP were 131.25 mmHg, 123.43 mmHg and 120.90 mmHg in patients having cholesterol, mixed and pigmented gallstones respectively. This parameter was statistically significant (p<0.27) [Table/Fig-9].

The mean diastolic BP was 83.08, 78.86 and 76.66 in patients having cholesterol, mixed and pigmented gallstones

Gallstone type	Diabetes		Total	Smoking		Total	Tobacco chewing		Total
	No	Yes		No	Yes		No	Yes	
Cholesterol	22	2	24	23	1	24	20	4	24
	91.7%	8.3%	100.0%	95.8%	4.2%	100.0%	83.3%	16.7%	100.0%
Mixed	43	3	46	42	4	46	44	2	46
	93.5%	6.5%	100.0%	91.3%	8.7%	100.0%	95.7%	4.3%	100.0%
Pigmented	26	4	30	28	2	30	25	5	30
	86.7%	13.3%	100.0%	93.3%	6.7%	100.0%	83.3%	16.7%	100.0%
	91	9	100	93	7	100	89	11	100
	91.0%	9.0%	100.0%	93.0%	7.0%	100.0%	89.0%	11.0%	100.0%

[Table/Fig-8]: Association of diabetes, smoking and tobacco chewing in cases with gallstones type
Chi-square = 1.046 p-value = 0.593 (NS) For diabetes cases
Chi-square = 0.504 p-value = 0.777 (NS) for smoking cases
Chi-square = 3.850 p-value = 0.146 (NS) for tobacco chewing cases

S. No	Index	Cholesterol stone (Mean)	Mixed stone (Mean)	Pigmented stone (Mean)	f-value	p-value
1	SYSTOLIC BP (mm Hg)	131.25	123.43	120.90	3.753	0.027 S
2	DIASTOLIC BP (mm Hg)	83.08	78.86	76.66	4.608	0.012 S
3	Hb	12.00	11.60	11.69	0.385	0.681 NS
4	TLC	8.27	7.74	7.48	0.764	0.469 NS
5	DLC	64.85	67.64	66.27	0.557	0.557 NS
6	BLOOD SUGAR	101.91	100.79	102.94	0.063	0.939 NS
7	SGOT	38.45	51.91	41.13	0.713	0.493 NS
8	SGPT	52.55	58.78	44.72	0.458	0.634 NS
9	ALKALINE PHOSPHATASE	140.29	195.95	142.82	0.917	0.403 NS
10	TOTAL SERUM BILIRUBIN	O.89	1.88	0.90	0.969	0.383 NS
11	DIRECT SERUM BILIRUBIN	0.46	1.08	0.53	0.803	0.451 NS
12	INDIRECT SERUM BILIRUBIN	0.43	0.81	0.37	1.130	0.327 NS
13	TOTAL SERUM PROTEIN	7.78	7.56	7.27	1.878	0.158 NS
14	ALBUMIN	4.16	3.99	3.93	0.582	0.560 NS

[Table/Fig-9]: Correlation of biochemical Indices of patients with gallstone types

respectively. The association of this parameter with gallstone types was statistically significant (p<0.012) [Table/Fig-9].

DISCUSSION

Gallstone formation results from many complex factors working together. The pathologic factor related to gallstone formation is still the hot debate. Bile stasis secondary to gall bladder dyskinesia is the most widely accepted theory. The study demonstrated that mixed type of gallstones account for about 46% of stones found in cholecystectomized patients, mainly in females and the ratio of male & female was 1:3. It is consistent with the reports of Bruce W. Trotman et al., [12] and Harshi T W Weerakoon et al., [13] and Aslam H.M. et al., [14].

Raised values of SGPT and alkaline phosphatase were observed in present study which is as similar as the findings of Aslam H.M. et al, 2013 [14] so, the occurrence of gallstones was positively correlated with rise in SGPT levels.

It is also proved that obese women secretes more cholesterol into their bile then a non obese female [15]. In present study, the incidence of Diabetes, Alcoholism, smoking, Tobacco chewing, Dietary habits in cases do not predispose to either type of gallstone formation. These findings are similar with the results of Harshi T W Weerakoon et al., [13] and Sherlock [16] .

Gallstone disease appeared to be increasing in incidence over past couple of decades in India and western world due to increased intake of fatty and high calorie diet and increased consumption of alcohol [17].

It was observed that despite the diverse mechanism of stone

induction and the differences before in stone composition, there is a quantitative increase in the epithelium mucus production in the period stone formation.

CONCLUSION

Gallstones appear to be most important risk factor being reported in 70 % to 98% cases of gall bladder cancer and it is the most common cancer of biliary tree and 5th most common gastrointestinal malignancy. This present prospective study confirms that femininity and obesity are strongly associated with gallstones formation presumably due to excess cholesterol in bile which eventuates in cholecystectomy at a mean age from 39 years to 45 years.

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