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**Research Article**

# A study of cholelithiasis in adolescent children attending a tertiary care hospital

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## ABSTRACT

**Background:** Cholelithiasis is relatively rare in children and there is paucity of information about cholelithiasis in adolescent children. There is no consensus among pediatricians and pediatric surgeons regarding the management of cholelithiasis in adolescents. Cholelithiasis is increasingly diagnosed due to wide spread use of ultrasound. This has led to increased detection of asymptomatic cholelithiasis. The profile of cholelithiasis in adolescents is analyzed in this study.
**Methods:** Medical records of patients with the discharged diagnosis of cholelithiasis from January 2010 to March 2015 were analyzed. Sixty children were enrolled in the study. Patients were divided into symptomatic and asymptomatic group depending upon the clinical presentation.
**Results:** Among the 60 children, 43 (71.7%) patients had no identifiable risk factor for cholelithiasis. Predominant identifiable risk factor was ceftriaxone use in 7 (11.7%) patients. Forty four (73%) were nutrionally normal, fifty one (85%) patients were symptomatic and nine (9%) patients were asymptomatic. Anemia was noticed in 46 (76.7%) patients. Laparoscopic cholecystectomy was done for 29 (48.3%) patients, other surgical procedures in 7 (11.6%) patients and 23 (38.3%) patients were treated conservatively. Seven out of 9 patients in the asymptomatic group and 14 of symptomatic group treated conservative management had spontaneous resolution of cholelithiasis.
**Conclusions:** Gallstones need not be always present with symptoms and there is a significant number of children who were asymptomatic. Majority of the patients do not have identifiable risk factors. Most of the children were underweight. Laparoscopic cholecystectomy was advised for majority of symptomatic cholelithiasis.

**Keywords:** Cholelithiasis, Gallstone, Adolescents

## INTRODUCTION

Cholelithiasis is relatively uncommon in younger age group. There is paucity of information about cholelithiasis in adolescent children from India and there is no consensus among pediatricians and pediatric surgeons regarding the management of cholelithiasis in adolescents. However there is an increase in the diagnosis of gallstones in adolescent age due to wide spread use of ultrasonography (USG) in diagnosis and management of gastrointestinal and genitourinary symptoms or even in the evaluation of systemic problems like persistent fever. This has led to increased detection of even asymptomatic gallbladder Calculi.[1-5] In children, however, the literature on the natural history of asymptomatic gallstones is limited to a number of smaller series.[6,7]

With this background of limited information on cholelithiasis, we analyzed the profile of cholelithiasis in adolescent children with special emphasis on presenting symptoms and predisposing factors.

## METHODS

This retrospective study was performed by review of the medical records of patients admitted in the pediatric department of Sri Ramachandra hospital, a tertiary care center in Chennai, South India. The study subjects were children in the age group of 12 to 18 years admitted as inpatients from January 2010 to March 2015 with the discharged diagnosis of cholelithiasis or choledocholithiasis based on ultrasonography. Ultrasonographic diagnosis of cholelithiasis was based on the presence of echogenic foci that produced acoustic shadowing in the gallbladder or in the region of gallbladder fossa. Data on demographic information, anthropometry, medical history, predisposing factors (hemolytic anemia, use of injection ceftriaxone within the past 2 weeks, progressive familial intrahepatic cholestasis, decreased oral intake, use of diuretics like furosemide for other illness), presenting symptoms, imaging findings, treatment, complication and outcome were noted.

Patients were divided into symptomatic group and asymptomatic group. Symptomatic group comprised of those with typical features of cholelithiasis such as right upper quadrant abdominal pain, epigastric pain, nausea, vomiting, fat intolerance and cholestatic jaundice and those with nonspecific abdominal pain in areas other than right upper quadrant or epigastrium (atypical group). Asymptomatic group comprised of those children in whom cholelithiasis was diagnosed incidentally without any typical symptoms as described above or abdominal pain.

All the children were managed in consultation with the pediatric surgical advice regarding surgical or conservative treatment. After discharge from the hospital patients were followed up over phone with queries focusing on persistence or resolution of symptoms. Data were analyzed by chi square test and the p values were calculated.

## RESULTS

### *Age and gender*

A total of 60 patients in adolescent age group diagnosed with gallstones from 2010 to 2015 were studied. The boys and girls were equal in number (30 each). Most of them belong to socioeconomic class III as per modified Kuppusamy scale.[8]

### *Predisposing factors*

The risk factors predisposing to gallstone formation are displayed in Table 1. Overall 43 (71.7%) patients had no identifiable risk factor and were categorized as idiopathic. Recent ceftriaxone usage was seen in 7 (11.7%) patients. Decreased oral intake was observed in 2 (3.3%) patients. Sickle cell disease, thalassemia and hereditary spherocytosis were seen 1 each (1.7%). There was one (1.7%) preterm child now presenting with Progressive familial intra hepatic cholestasis (PFIC). Out of 60 children, 44 (7.3%) were nutritionally normal as per BMI. Thirteen (21.7%) children were underweight and 3 (5%) were obese.

**Table 1: Predisposing factors for cholelithiasis.**

| Predisposing factor | Frequency | Percentage (%) |
|---|---|---|
| Idiopathic | 43 | 71% |
| Decreased oral intake | 2 | 3.3% |
| Sickle cell disease | 1 | 1.7% |
| Thalassemia | 1 | 1.7% |
| Hereditary spherocytosis | 3 | 5% |
| Furosemide | 1 | 1.7% |
| Ceftriaxone | 7 | 11.6% |
| PFIC* | 1 | 1.7% |
| Chronic liver disease | 1 | 1.7% |
| Total | 60 | 100% |

*(PFIC ) Progressive Familial intrahepatic Cholestasis

### *Clinical presentation*

In this study 51 patients (85%) belonged to symptomatic group and 9 patients (15%) were in asymptomatic group as shown in Figure 1.

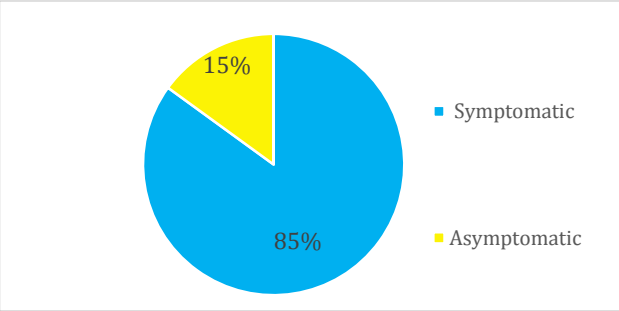


**Figure 1: Clinical presentation.**

Of the 51 symptomatic children, 34 (67%) were in typical symptomatic group and 17 (33%) were in atypical group.

Table 2 shows the percentage of patients showing symptomatology. Predominant complaint was noticed as right upper quadrant pain in 15 (25%) patients; those with right upper quadrant pain associated with vomiting were in 10 (16.6%) patients. Twelve (20%) patients had nonspecific abdominal pain whereas epigatsric pain was noticed in 7 (11.6%) patients and 5 (8.3%) patients had fever with diffuse pain abdomen. One (1.6%) patient each was noticed to have fat intolerance and cholestatic jaundice. Nine patients had no symptoms related to gall stones and it was incidentally found out by ultrasonogram done for other diagnosis such as evaluation of fever.

**Table 2: Symptoms in cholelithiasis.**

| Symptomatic group | Frequency | (%) |
|---|---|---|
| Isolated right upper quadrant pain | 15 | 25% |
| Epigastric pain | 7 | 11.66% |
| Right upper quadrant pain with vomiting | 10 | 16.6% |
| Fat intolerance | 1 | 1.6% |
| Cholestatic jaundice | 1 | 1.6% |
| Non specific abdominal pain | 12 | 20% |
| Fever + non-specific abdominal pain | 5 | 8.3% |
| **Total** | 51 | 85% |
| **Asymptomatic group** | | |
| No abdominal symtoms/incidental diagnosis | 9 | (15%) |

***Site of involvement***

All 60 patients were diagnosed by abdominal ultrasonography. Gall bladder stones were predominant in 54 patients (90%) and common bile duct stones were noticed in 6 (10%) patients. There was no other ultrasonographic finding such as pancreatic or liver involvement.

***Laboratory investigations***

Anemia was noticed predominantly in 46 (76.7%) patients. Elevated alanine aminotransferase was noted in 19 (31.7%) and 14 (23.3%) patients had elevated alkaline phosphatase. GGT was found to be elevated in 15 (25%) patients. Abnormal lipid profile was identified in 5 (8.3%) patients.

***Management***

Twenty nine (48.3%) patients underwent laparoscopic cholecystectomy. Endoscopic retrograde cholangiopancreatography (ERCP) with stent placement was done in 6 (10%) patients. Open cholecystectomy was done in one (1.7%) patient and one (1.7%) patient received pharmacotherapy alone. Conservative management with periodic observation and follow up was done in 14 of the total 51 children in symptomatic group and all the 9 in asymptomatic group with the total of 23 (38.3%) patients (Table 3).

**Table 3: Management of cholelithiasis.**

| Procedure | Frequency | (%) |
|---|---|---|
| Laparascopic cholecystectomy | 29 | 48.3% |
| Open cholecystectomy | 1 | 1.7% |
| Pharmacotherapy (UDCA)* | 1 | 1.7% |
| Conservative management | 23 | 38.3% |
| ERCP# with stent placement | 6 | 10% |
| **Total** | 60 | 100% |

Cholecystectomy was done at the time of acute symptoms in 23 (38%) patients, on follow up in 5 (8.3%), during complication in 1 (1.7%) patient and during another elective procedure in 1 (1.7%) patient.

***Outcome and follow up***

On follow up, 23 (38.3%) patients were advised conservative treatment, 10 (43%) patients became asymptomatic, one patient (1.7%) had improvement of symptoms, and 12 (52%) patients were lost for follow up. Out of 51 patients in symptomatic group 10 were lost for follow up and in the asymptomatic group 2 out of 9 were lost for follow up (Table 4).

**Table 4: Outcome.**

| | Frequency | (%) |
|---|---|---|
| Continued to be symptomatic | 7 | 11.7% |
| Became asymptomatic | 10 | 16.7% |
| Symptomatic, but betterment of symptom | 1 | 1.7% |
| Post op status | 30 | 50% |
| Lost to follow-up | 12 | 20% |
| Total | 60 | 100% |

On follow-up, spontaneous resolution was seen in 21 (35%) children, of whom 14 (67%) patients belonged to symptomatic group and 7 (33%) belonged to asymptomatic group. Fifty four (90%) of them did not undergo any complication whereas cholecystitis seen in 3 (5%), ascending cholangitis in 1 (1.7%) patient. Both pancreatitis and cholecystitis in one (1.7%) patient each (Table 5).

**Table 5: Follow up.**

| Clinical presentation | Spontaneous resolution | | Total |
|---|---|---|---|
| | Yes | No | |
| Symptomatic | 14 | 37 | 51 (85%) |
| Asymptomatic | 7 | 2 | 9 (15%) |
| Total | 21 (35%) | 39 (65%) | 60 (100%) |

## DISCUSSION

Cholelithiasis is common in adults and its prevalence and predisposing factors vary from the pediatric age group. The prevalence of gallstones among adult population in the west is 10% to 20% and in India is 3% to 6%.[9-11] The prevalence of gall stones is seven times more frequent in north India than in south India.[12] Studies from Europe have shown an overall prevalence of the disease was 0.13% to 0.12%.[13] The exact prevalence of gallstone in adolescents is not known. The only report from India by Ganesh, et al has shown a prevalence of 0.3% in a hospital based observation among 13,675 children and adolescents.[14] After the wide spread use of ultra-sonogram, some new studies are emerging on cholelithiasis in pediatric age group.[15]

In our study of 60 adolescents with cholelithiasis, there was an even distribution among all adolescent age groups and there was no gender predominance. Bogue et al also reported equal gender frequency.[13] Most of the children belong to socioeconomic class III.

Symptomatic patients defined as those with typical features of cholelithiasis such as right upper quadrant abdominal pain, epigastric pain, nausea, vomiting, fat intolerance and cholestatic jaundice and those with non-specific abdominal pain were predominant over asymptomatic group. Unlike the adults having asymptomatic disease over 80%, adolescents are less likely to present with asymptomatic presentation, ranging between 17%-50%.[16,17]

In the present study, the frequency of asymptomatic disease was concordant with the current literature by being observed in only 15% of the study population. Most of the patients with gallstones, presented with typical symptoms predominantly right upper quadrant pain. In contrast to the symptoms, abdominal examination was normal in 51.7% and tenderness was present only in 36.7% of patients. Obesity is a known risk factor for cholelithiasis whereas in our study most of them were observed to be underweight than obese or overweight.

On analyzing of predisposing factors, most of the adolescents with gall stones did not have any factor (idiopathic-43; 71.7%). In other studies, the idiopathic category was reported between 23.2%-52.5%.[3-6] Thirty eight patients out of 51 in the symptomatic group and 5 out of 9 patients from asymptomatic group did not have any predisposing factors. Among the identifiable factors, commonest was use of ceftriaxone in the past two weeks. In a study Poddar U, found that ceftriaxone induced cholelithiasis in 15-46% of patients and the stone dissolved within 1 month after cessation of therapy.[1] In our study ceftriaxone usage was seen in 7 children (11.7%) and all them underwent spontaneous resolution.

Many studies state that hemolytic anemia constitutes about 40 -50% as etiology for paediatric cholelithiasis. In the study by Poddar, hemolytic anemia constituted about 40 % as cause for pediatric cholelithiasis.[1] Our present series does not show such an association, as hemolytic anemia was present in only three of our 60 cases. But in contrast to all other literature, our study reveals 46 children (76.7%) with iron deficiency anemia (IDA). There is no literature available to support such a frequent occurrence of IDA in cholelithiasis. It is not known if it reflects the high incidence of anemia in this population, as we did not have a comparable group of normal children.

Our study shows only 8.3% (n=5) patients had abnormal lipid profile but there are other studies which show that there is a significant rise in cholesterol levels to favour more of cholesterol stones. Koivusalo shows that of all gallstones, cholesterol stones constitute about 21% indicating the abnormal lipid profile.[18]

Management of gallstones depends on the symptoms and the age of the patients and there is no consensus about the management of asymptomatic gall stones in children. In recent years laparoscopic cholecystectomy has proved to be advantageous over open cholecystectomy due to its minimally invasive nature.[19] In our study laparoscopic cholecystectomy was done predominantly in the patients who presented with acute symptoms and a few patients underwent surgery during follow up. Most of the patients underwent laparoscopic cholecystectomy accounting for 29 (48.3%), ERCP with stent placement in 6 (10%) patients, open cholecystectomy in 1 (1.7%) and pharmacotherapy usage in 1 (1.7%).

In a prospective study of children with non-pigmented stones, Bruch et al followed up children diagnosed with cholelithiasis and found that 50% remained or became asymptomatic, 32% experienced definite improvement in symptoms and 18% had continued symptoms.[20] In our study on analyzing the outcome we found 30 (50%) patients were in post-operative status, 10 (16.7%) previously symptomatic patients became asymptomatic, one child (1.7%) continued to be symptomatic but with betterment of symptoms and 12 (20%) patients were lost for follow-up.

Twenty one (35%) patients had symptoms resolved spontaneously. Out of which, 14 patients belong to symptomatic group and 7 patients from asymptomatic group.

Various studies discussed about complications. Our study had 10% of patients underwent complication whereas Bogueu et al, in their study of 58 patients, showed that 9% of children developed complications like cholecystitis and isolated choledocholithiasis. None developed pancreatitis.

## CONCLUSION

- Gallstones need not alwayspresent with typical symptoms. There are a significant number of adolescent children who were aymptomatic and were picked up incidentally by ultrasonography. Majority of typical symptomatic group present with right hypochondrial pain.
- Majority of adolescents did not have any identifiable predisposing factor (idiopathic). Among the identifiable factors, ceftriaxone usage was commonest. All patients with ceftriaxone usage underwent spontaneous resolution after stopping the drug.
- Most of the adolescents in the study were found to be in the underweight group than obesity.
- Anemia was the predominant laboratory finding. There was no significant number with hemolytic anemia in this study.

- In our study for symptomatic adolescents with cholelithiasis, laparoscopic cholecystectomy was carried out. Watchful observation with periodic follow-up was done in asymptomatic patients or in those with non-specific symptoms and a significant number of them improved.
- Most of the adolescent patients did not develop any complication.

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