pISSN 2349-3305 | eISSN 2349-2902

Original Research Article

DOI: http://dx.doi.org/10.18203/2349-2902.isj20164450

Evaluation and management of cholelithiasis in children: a hospital based study

Sanjay Kumar Bhasin*, Ankit Gupta, Sunita Kumari

Department of Surgery, Government Medical College, Jammu, Jammu & Kashmir, India

Received: 16 September 2016 **Accepted:** 20 October 2016

*Correspondence:

Dr. Sanjay Kumar Bhasin,

E-mail: sanjaykbhasin@yahoo.co.in

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ABSTRACT

Background: Earlier cholelithiasis was extremely unusual in childhood. Presently there is sharp increase in detection of cholelithiasis in children, which forms basis to investigate the overall changing pattern of cholelithiasis. This prospective study in referral centre has been under taken to evaluate childhood cholelithiasis and its management.

Methods: The present prospective study was conducted in the Postgraduate Department of Surgery, GMC Jammu, Jammu & Kashmir, India over a period of two years. 80 patients in age group of 3-14 years were included in the study group with ultrasound proved cholelithiasis. Data reviewed with respect to patient demographics profile, clinical history including risk factors, imaging studies, operative techniques, postoperative complications, postoperative recovery and primary outcome parameters assessed accordingly.

Results: During the study period 80 children (52 males and 28 females) with cholelithiasis were evaluated and treated by laparoscopic cholecystectomy. The mean age was 10.1 years (range 5 to 14 years). 75% patients (n = 60) belonged to rural background and rest to urban set up, 56 patients belonged to hindu religion and rest were muslims. In 47.5% patients no risk factor could be traced. Fifty two children (65%) had mixed gallstones. 78 patients underwent LC, two needed conversion and rest 02 children were subjected to mini cholecystectomy. The mean operative duration was 29.92 minutes (range 15-50 minutes). The average duration of hospital stay was 3.82 days (range 3-8 days). No major intra operative or post-operative complications could be detected except 01 case biliary peritonitis.

Conclusions: Cholelithiasis in children was reported about three centuries back, remained relatively uncommon in the past but now it is evolving and ever increasing in frequency. In this part of country in almost 50% of patients risk factors could not be traced, obesity could not be held responsible for cholelithiasis. Male children with low socioeconomic status, rural area and belonging to Hindu religion were more affected by the disease. In view of high incidence of serious complications of gall stones in children and because of longer life expectancy we also recommend that expectant management of gallstones may not be safe and hence laparoscopic cholecystectomy must be done even in asymptomatic cholelithiasis.

Keywords: Cholelithiasis, Childhood, Laparoscopic cholecystectomy, Mini cholecystectomy

INTRODUCTION

Cholelithiasis is quite common in adults (10% to 20%) with worldwide variability. In India, it is 3% to 6%, more frequent in north India than in south India. As far as cholelithiasis in children is concerned there is a dramatic change in the overall spectrum of this disease with global

increase in the incidence.² Overall prevalence in Europe is 0.13% to 0.2% in children. In Japan, it is less than 0.13% of children & about 0.3% in India.^{3,4} Childhood cholelithiasis is evolving with an ever increasing frequency of cholecystectomies in children.⁵ Risk factors in childhood cholelithiasis, can be hemolytic causes (20-30%), other known etiology (40-50%) such as total

parenteral nutrition, prolonged fasting, ileal disease/ileal resection, frusemide therapy, congenital biliary diseases such as choledochal cyst, chronic liver disease and progressive familial intrahepatic cholestasis (PFIC). Around 30% to 40% of cases are idiopathic. As is seen in adults, gallstones in adolescent girls are also more often idiopathic.⁷ Most common presentation is typical right upper quadrant pain (50%); and in 25% there may be non-specific abdominal symptoms including poorly localized abdominal pain and nausea. Around 20% of cases are asymptomatic (incidentally detected stone).8 Adult symptomatology of cholelithiasis, tends to be reported in older children.^{9,10} Ultrasound is the most common diagnostic test with sensitivity and specificity exceeding 95%. Cholescintigraphy with technetium 99m labeled di-isopropyl iminodiacetic acid (DISIDA), is the most accurate method of diagnosing acute cholecystitis.¹¹

Spontaneous resolution has been reported in about 50% cases of childhood cholelithiasis within 6 months typically in idiopathic gallstones. Cholecystectomy is indicated for symptomatic cholelithiasis, asymptomatic cholelithiasis persisting beyond 12 months and radio-opaque calculi. Laparoscopic cholecystectomy is confirmed to be a safe and efficacious treatment for pediatric cholelithiasis with low rate of postoperative complications. Laparoscopic cholecystectomy is

The study was undertaken to evaluate epidemiological factors as well as management options and their outcome in this part of country where incidence of adult cholelithiasis is quite high.

METHODS

The present prospective study was conducted in the Postgraduate Department of Surgery, GMC Jammu over a period of two years. 80 patients in age group of 3-14 years were included in the study group with ultrasound proved cholelithiasis. Patients with congenital heart disease, mental retardation, delayed milestones; coagulopathies and any other co-morbid condition contraindicating general anesthesia were excluded from the study group. The patients were admitted for preoperative evaluation and work up including preanesthetic check-up prior to surgery. All the patients were operated under general anesthesia. Single dose of antibiotic was administered to all the patients at the time Laparoscopic-cholecystectomy of induction. completed in 76 patients in supine position with standard four port method as is done in case of adults. 02 patients were subjected to mini-cholecystectomy and 02 were converted to open-cholecystectomy. The patients were permitted to take oral fluids once bowel sounds returned. Injectable analgesics were given to keep the patients pain free. The primary outcome parameters assessed were post-operative pain, duration of hospital stay and time taken to resume normal daily activities as well as postoperative complications.

RESULTS

In the present study, the age ranged from 03-14 years (10.1 years). Forty four patients (55%) were in the age group 11-14 years (n=44), 10% patients (n=8) were < 05 years. M:F ratio was 1.85:1, 52 patients being male and 28 females. Sixty patients (75%) belonged to rural background and rest to urban set up. Furthermore, 70% patients (n=56) belonged to hindu religion where as 30% patients (n=24) were muslims, 67.5% patients (n=54) belonged to lower socioeconomic status and 32.5% (n=26) from middle class. 24 patients (30%) were vegetarians and 70% patients (n=56) were mixed diet consumers. No history of junk food consumption could be detected.

Risk factors for cholelithiasis in children

In the present study 52.5% patients (n = 42) patients had various risk factors for cholelithiasis including 15% patients (n = 12) with history of antibiotic use for various clinical conditions like upper respiratory tract infections, acute gastro enteritis, pyrexia etc., 5% (n = 04) had hemolytic disease, two had sickle cell anemia and two 10% patients (n = 08) were were thalessemic, overweight, 12.5% patients (n=10) had history of cholelithiasis in either mother or father. 2.5% patients (n = 2) had history in both parents and 2.5% patients (n = 2) had history of cholelithiasis in his brother, 5% patients (n = 04) had history of prematurity and 5% patients (n = 02) had hypertriglyceridemia. There were 47.5% patients (n=38) in whom no risk factors were found (Table 1).

Table 1: Risk factors for childhood cholelithiasis.

Risk factor	No. of patients	Percentage
Familiarity	14	17.5
Hemolytic disorder	04	05
Antibiotic therapy	12	15
Hypertriglyceridemia	04	05
Overweight	08	10
History of prematurity	04	05
No risk factors	138	47.5

Symptomatology

In this study 20% of the patients (n=16) were asymptomatic, cholelithiasis being incidental finding on USG while getting investigated in pediatric ward for fever and inability to thrive and later shifted to surgery unit for further management. Of the symptomatic patients, 60% of the patients (n=48) presented with history of vague abdominal pain, 36 patients (45%) each had history of dyspeptic symptoms and acute abdominal symptoms, recurrent abdominal pain (colic's) was observed in 12.5% patients (n=10) and history of vomiting was present in 7.5% patients (n=6). In

symptomatic patients duration of symptoms was 6-9 months. Only 22.5% patients (n=18) had mild tenderness in RHC, in rest of them no positive findings were present. Ultrasound revealed multiple stones in 46 patients (57.5%); biliary sludge/concretions with polyps were noted in 5% patients (n=4) (Table 2).

Table 2: Symptomatology in patients.

Symptoms*	No. of patients	Percentage
Vague upper abdominal pain	24	60
Acute pain rt. hypochondrium	18	45
Jaundice	01	2.5
Dyspeptic symptoms	18	45
Abdominal colics (recurrent)	05	12.5
Vomiting and indigestion	03	7.5
Asymptomatic (admitted for fever in pead ward)	08	20

Note: More than one symptom observed in single patient.

Intra-operative findings

Intra-operatively multiple adhesions were present in 14 patients. Mucocele of gallbladder was seen in 03 patients whereas empyema of gallbladder was present in one patient with dense adhesions obscuring calot's triangle requiring conversion to open. In 01 female patient aged 12 years thick walled contracted gallbladder with difficult calot's triangle anatomy led to conversion to open cholecystectomy.

Type of stones

More than Half of the patients had Mixed stones i.e, 65% patients (n = 52). 20% patients (n = 16) had pure pigment stones while only 15% patients (n = 12) had pure cholesterol stones.

Operative time

In the present study, the mean operative time was 26.92 minutes (15-50 minutes). In 03 patients it was more than 40 minutes that included 02 cases of conversion to open cholecystectomy.

Postoperative parameters

Mild pain was observed in 70% of the patients (n = 56) on 1st POD, whereas; severe pain was present in 5% patients (n = 4). In our study post-operative pain was assessed according to the demand of analgesics by the patients and or their parents as VAS was crude indicator of pain assessment in pediatric population. Inj diclofenac sodium I/M in calculated doses were used in > 7 years of age whereas, in < 7 years of age, paracetamol suppository or inj paracetamol was used as analgesic. Majority of the patients (n = 38) required only 02 doses of analgesics whereas; maximum of 08 doses were required in 04

patients (5%) only. Majority of the patients 80% (n = 64) had passed flatus on the first post-operative day and hence were allowed oral sips. 64 patients (80%) were ambulatory by first post-operative day.

Complications

Intra-operatively no major complication was encountered. Postoperatively 5% patients (n = 04) had nausea/vomiting which was managed by single calculated dose of injection ondensetron. 7.5% patients (n = 06) had shoulder tip pain. 5% patients (n = 04) had wound infection. No worrisome late complications were noted except scar tenderness in 6 patients that was managed by reassurance & analgesics alone. One 4 years old male patient residing in far flung, hilly area presented after 8 weeks of laparoscopic cholecystectomy with loss of vigor, loss of appetite and fever. Biliary Peritonitis was diagnosed and laparotomy was done after proper workup for general anesthesia. 500 ml bilious fluid was drained from peritoneal cavity and cystic duct ligated with 2-0 vicryl from where liga clips had slipped. Post-operative period was uneventful and patient was discharged on 4th P.O.D. On long term follow up for 01 year, no complications were observed.

Histo-pathological findings

Forty eight patients had normal mucosal pattern, 25% (n = 20) had findings of chronic cholecystitis and 12.5% (n = 10) had mild acute cholecystitis and 02 patients had histological features suggested of xantho granulomatous cholecystitis.

Duration of post-operative hospital stay and RTW

In the present study, the maximum duration of hospital stay observed after surgery was 5 days and minimum was 1 days with mean duration of hospital stay being 1.75 days. The mean interval to return to daily routine was 3.82 days (3-8 days). Majority of the patients (n = 64) returned to their routine daily activity by 4^{th} day.

DISCUSSION

Although cholelithiasis in children was reported by Gibson in 1737 for the first time yet it remained relatively uncommon in the past. However, presently cholelithiasis in children and adolescents is evolving and studies suggest its ever increasing frequency and resultant cholecystectomies at early age. ¹⁵ The higher incidence of obesity in children and the increased use of USG have a significant effect in the diagnosis of gallstones. Pathogenesis of gallstones and sludge in children is still unclear.8 As little is known about natural history of childhood cholelithiasis hence guidelines management are lacking. It has been observed that most of the time the gallstones remain un-detected in pediatrics population until complications develop. 16 As non-surgical approaches have proved ineffective due to severe restriction on their applicability hence laparoscopic

cholecystectomy is considered the gold standard treatment in children also. \(^{17,18}\)

In the present our study, the mean age of the patients was 10.1 years (03-14 years). Majority of patients (n = 44) were in the age group of 11-14 years. It is consistent with similarly situated studies in the literature. ^{5,6,19,20} The male: female ratio in our study was 1.85: 1 (52 vs 28). Strausse et al in his study observed females dominance i.e. 11 females and 2 males whereas; Pokorny et al and Malik et al in their study reported higher of gallstones in boys. ²¹⁻²³ However same incidence in both sexes was observed in other studies. ^{13,14}

Geographically 75% patients (n = 30) belonged to rural/hilly background and 70% (n = 56) were hindu. Furthermore, 67% of the patient (n = 27) belonged to lower socioeconomic strata and 32.5% (n = 26) belonged to middle income group. These are new epidemiological parameters studied and added to the surgical literature on the subject as medline/pub med search could not reveal any such study. 12.5% patients (n = 10) had history of cholelithiasis in either mother or father. 2.5% patients (n = 2) had history in both parents and 2.5% patients (n = 2) had history of cholelithiasis in siblings. Familiarity has also been reported in other studies. 8.24 Association of junk food consumption with childhood cholelithiasis could not be established. Obesity in many studies has been documented as major risk factor. 25-27

No risk factor could be established in 38 patients (47.5%) in present study. However 12 patients (15%) had history of antibiotic consumption for use for various clinical conditions, 4 patients (5%) had hemolytic disease and 8 patients (10%) were overweight, 14 patients (17.5%) had positive family history. Corte et al in their study reported that 95 patients (52.5%) had no risk factors, 24% patients (n = 51) had family history, 16 patients (7.6%) had hemolytic disorders, obesity in 14 patients (6.7%) and antibiotic consumption in 11 patients (5%).8 Malik et al observed no risk factor in 18 (78%) patients while 02 (9%) patients has sickle cell disease and 03 (13%) patients had a positive family.²³ Similarly, Gocke et al in their observed no identifiable risk factors in 43.5% children, whereas; 16.1% were having familial history, 12.9% hemolytic diseases, 8.1% were overweight and 12% children had history of antibiotic intake.²⁸ 20% (n = 16) of the patients were asymptomatic in this study. Prevalence of asymptomatic gallstones have been reported to be 17-50.5% in various studies and our results were consistent with the literature. 5,8,9,20 In symptomatic group, 60% (n = 48) patients presented with history of vague abdominal pain, 45% (n = 36) each had dyspeptic symptoms and intermittent colic. Vomiting was present in 6 patients. Our observations were consistent with other studies. ^{29,30} Laparoscopic cholecystectomy was successfully performed in 78 patients, 02 were converted to open cholecystectomy due to multiple adhesions and empyema of GB and in another 02 mini-cholecystectomy was done when attendants refused for laparoscopic

cholecystectomy. Abkari et al in their study converted 17% (n = 11) patients to open cholecystectomy due to difficult anatomy, adhesions and thick walled gallbladder. Deepak J et al and Curro et al in their study converted 01 patient each to open cholecystectomy. ^{6,31,32}

Multiple stones were seen in 46 patients (57.5%), 28 patients (35%) had single stones and 06 patients had biliary sludge/cholestrosis associated with gallbladder polyps. No patient had stones in common bile duct. Miltenburg et al in their study found that 15.8% of patients had associated stones in the common bile duct.³³ Gumiero et al observed in their study that 88 patients had multiple stones and 12 patients had one single gallstone.²⁴ Dooki and Norouzi reported in their study that 19 (29%) patients had solitary gallstones and in 47 patients (71%) there were multiple gallstones, moreover 3% of the patients had stones simultaneously in the common bile duct (CBD) and 1.5% in cystic duct.³⁰ Furthermore, 52 patients (65%) had mixed stones. 16 patients (20%) had pure pigment stones while only 12 patients (15%) had pure cholesterol stones. Holcomb et al in his study observed that in majority of the patients, the gallstones were composed of cholesterol primarily and varied in color from pale yellow to dark yellowish brown with a few having greenish color.9 Similarly, Deepak J et al observed that 20 patients had pigmented stones and 02 patients had cholesterol stones.

Mean operative time in present study was 26.92 minutes (15 to 50 minutes). This was much less than OT reported by other available studies in the literature. 32,35-37 In the present study, post-operative pain was assessed as per the demand of the patient or the parents/attendants for analgesic as VAS is a crude indicator of pain assessment in children. On an average 2.12 doses (02 to 08 doses) of analgesics were required in the postoperative period with mean length for their use as 1.2 days (01 - 04 days). Jawad et al observed mean length for use of parenteral analgesia as 0.47 days (range 0.3 to 1 day). 36 Others have also reported similar findings.

There was no major intra-operative complication observed in our study. 04 (5%) patients had intra-operative gallbladder perforation and spillage of bile. Post-operatively, nausea/vomiting was observed in 04 (5%), 04 (5%) patients had shoulder tip pain, 02 (5%) patients had wound infection confined to epigastric port, 01 patient of bilioma presenting 8 weeks after laparoscopic cholecystectomy was managed with laparotomy under general anesthesia cystic duct ligated with 2-0 vicryl from where liga clips had slipped, post-operative period was uneventful and patient was discharged satisfactorily on 8th day. Al-Abkari et al reported bile leak in 9 patients (25%) with sickle cell anemia. Other available series have hardly reported any postoperative complications.

Hospital stay after surgery was 1-5 days (1.75 days) in the present study. Ranendra et al (387, reported POHS of 2 days (range 2 - 4 days), Deepak J et al reported 4.1 days (range 3-6 days), whereas; Curro et al and Jawad reported comparatively longer POHS. 6.22,36 The mean interval of days to return to daily routine was 3.82 days (3-8 days) in our study. In the study by Bogue, the children resumed their normal activities almost immediately after returning home. In long term follow up of 1 year no complications or bothering symptoms could be observed. 50% (n = 40) patients are still under our follow up for long term assessment of effect of GB removal on the patients.

CONCLUSION

Cholelithiasis in children was reported about three centuries back, remained relatively uncommon in the past but now it is evolving and ever increasing in frequency. In this part of country in almost 50% of patients risk factors could not be traced, obesity could not be held responsible for cholelithiasis. Male children with low socioeconomic status, rural area and belonging to Hindu religion were more affected by the disease. In view of high incidence of serious complications of gall stones in children and because of longer life expectancy we also recommend that expectant management of gallstones may not be safe and hence laparoscopic cholecystectomy must be done even in asymptomatic cholelithiasis. In view of familiarity and obesity not playing much role as risk factor in this part of globe, we recommend that further community based larger studies are needed to establish risk factors for childhood cholelithiasis and prevention thereof in this part of country.

Funding: No funding sources Conflict of interest: None declared

Ethical approval: The study was approved by the

institutional ethics committee

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Cite this article as: Bhasin SK, Gupta A, Kumari S. Evaluation and management of cholelithiasis in children: a hospital based study. Int Surg J 2017;4:246-51.