

## Cholelithiasis and chronic cholecystitis in a ten-year-old-boy: a case report



Carissa Lidia<sup>1\*</sup>, I Gusti Ngurah Sanjaya Putra<sup>1</sup>, I Putu Gede Karyana<sup>1</sup>,  
Ni Nyoman Metriani Nesa<sup>1</sup>, I Made Darmajaya<sup>2</sup>, Kadek Deddy Ariyanta<sup>2</sup>

### ABSTRACT

**Background:** Cholelithiasis in children is uncommon and challenging to diagnose because the patient is often asymptomatic and the clinical feature doesn't clearly depict cholelithiasis or cholecystitis. This case study aims to describe a rare case of cholelithiasis with chronic cholecystitis in a ten-year-old boy.

**Case Presentation:** A ten-year-old boy presented with umbilical pain, nausea, and emesis. Physical examination showed there is no tenderness in all abdominal quadrants with a negative Murphy sign. Laboratory results revealed elevated white blood cell count  $20.42 \times 10^3/\mu\text{L}$ , elevated erythrocyte sedimentation rate 47.2 mm/hour, normal liver function tests, urine, and stool analysis. He underwent transabdominal ultrasound twice. The latest transabdominal ultrasound showed cholelithiasis, free fluid around the pelvic region due to suspected visceral organ

perforation. Laparoscopic cholecystectomy was performed without complication. The result of pathology anatomy examination was chronic cholecystitis. The patient was discharged 3 days after surgery in good condition. The long-term prognosis of the patient was good.

**Conclusion:** Even though the patient is male with good nutritional status (not obese), the patient was in the mean age that was identified as a key contributor to this disease. Ultrasonography examination is a screening modality that is still an excellent diagnostic tool with 95% accuracy even though it is highly operator dependent. Laparoscopic cholecystectomy is a gold standard for management even in children with decreased pain and shorter lengths of stay in the hospital.

**Keywords:** Cholelithiasis, Cholecystitis, Chronic, Boy

**Cite This Article:** Lidia, C., Putra, I.G.N.S., Karyana, I.P.G., Nesa, N.N.M., Darmajaya, I.M., Ariyanta, K.D. 2020. Cholelithiasis and chronic cholecystitis in a ten-year-old-boy: a case report. *Intisari Sains Medis* 11(3): 1252-1257. DOI: [10.15562/ism.v11i3.684](https://doi.org/10.15562/ism.v11i3.684)

### INTRODUCTION

Gallstones disease is the most common and costly of all digestive diseases in the United States, resulting in 700.000 cholecystectomies and as many as 1.000.000 hospitalizations annually.<sup>1</sup> The frequency of hospital admission and operation for gallstones increased in Western countries since the 1950s.<sup>2</sup> In England, the age-standardized hospital admission rate for cholelithiasis enhanced from 68.7 to 104.9 per 100.000 population between 1989/1990 and 1999/2000 and it increased progressively with age from 1.1 per 100.000 in the 0-14 years age group to 277.1 per 100.000 in the  $\geq 85$  years age group in 1999/2000.<sup>2</sup>

Although cholelithiasis is usually considered a condition in adults, it has existed in the pediatric age group for over 240 years.<sup>3</sup> Perhaps the first description of gallstones in a child in the English literature was recorded by Gibson in 1737.<sup>4</sup> This Edinburgh surgeon reported the case of a 13-year-old boy who was examined by him 13 months following trauma to the right side of his chest. Gibson described removing "three Scotch pints of water of a greenish hue" by paracentesis from the

child's abdomen.<sup>4</sup> The patient died two days later, and an autopsy revealed a distended common duct filled with many porous, yellow stones. Ulin et al. completed a comprehensive study of cholecystitis in children in 1952 and accepted 326 cases reported in the literature as having a proper diagnosis.<sup>5</sup>

In a study of 27 children under 16 years of age with nonhemolytic cholelithiasis, Hagberg et al. discovered low serum lipid values in each of these children.<sup>6</sup> These authors also determined that hypercholesterolemia did not seem to be an etiologic factor causing gallstones in childhood.<sup>6</sup> Another has suggested a relationship between gallbladder disease and obesity. The association of obesity with nonhemolytic cholelithiasis was found in 33% of previous study.<sup>7</sup>

While it is doubtful that the exact mechanism of gallstone formation can be identified as a single factor, at present, it must be thought of as a combination of interacting processes including dehydration, endocrine, transient hepatic dysfunction, hereditary, dietary, inflammatory, and sex-related influences which affect the composition of bile.<sup>7</sup>

<sup>1</sup>Department of Child Health, Faculty of Medicine, Universitas Udayana, Sanglah General Hospital, Bali, Indonesia

<sup>2</sup>Department of Pediatric Surgery, Faculty of Medicine, Universitas Udayana, Sanglah General Hospital, Bali, Indonesia

\*Corresponding to:  
Carissa Lidia; Department of Child Health, Faculty of Medicine, Universitas Udayana, Sanglah General Hospital, Bali, Indonesia; [carissalidia@yahoo.com](mailto:carissalidia@yahoo.com)

The preferred treatment for chronic cholecystitis is laparoscopic cholecystectomy.<sup>8</sup> It has a very low complication rate, less than 2%, with a relatively fast recovery time, about 1 week.<sup>8</sup> Open cholecystectomy can also be performed very safely with a similar complication rate. Recovery time is longer due to the larger incision. This surgery is done in patients who are not laparoscopic candidates, such as those with extensive prior surgeries and adhesions.<sup>8</sup>

Based on those mentioned above, this study aims to describe the clinical presentation and management of cholelithiasis and chronic cholecystitis, improving a patient's outcome with cholelithiasis.

## CASE DESCRIPTION

AAAR, a ten-year-old boy, was brought to the pediatric emergency department (ED) Sanglah Hospital by his parents with a chief complaint of abdominal pain since 4 days prior to admission. The abdominal pain was felt at the umbilical site. The pain was sharp, intermittent, and worsened after the patient eat. Three days prior to admission, the patient felt pain at the epigastric and referred to the umbilical. The patient also complained of vomiting for 5 days prior to admission. He vomited everything he eats or drinks, at about a quarter to a third of a glass every time he vomits. The vomit was accompanied by nausea. Any history of fever was denied. The patient could not defecate for 5 days before admission, but at the time of admission, the patient could defecate with a soft consistency, normal color, without any blood.

Five days prior to admission patient was admitted to Wangaya Hospital with diagnosis observation of vomiting because of gastritis and was medicated with ondansetron, ranitidine, and intravenous fluid drip KaEN 3B. The day after that patient had abdominal pain at the umbilical region and was given pain medication (Paracetamol 300 mg IV) and antibiotic Ceftriaxone. Two days later, the patient complained of severe abdominal pain and was consulted with a surgeon. According to physical examination, the patient was presented with 'défense musculaire,' positive murphy sign, and was diagnosed with cholecystitis. Then the patient was referred to Sanglah Hospital for further evaluation and treatment. There was no history of the same disease in the family. None of the family members had diabetes and hemolytic disease. No obesity was found in family members. Physical examination revealed taken well-nourished based on Waterlow it was 104%.

When the patient was examined at the pediatric ED, the patient did not feel any abdominal pain. The patient looked moderately ill with a level of

consciousness was *compos mentis* (E4V5M6). His blood pressure was 90/50 mmHg, heart rate was 92 beats per minute, respiratory rate was 28 breaths per minute, temperature axilla was 37°C, oxygen saturation was 98% on room air. His head and neck examination were within normal limits. His lung was clear to auscultation. The result of his cardiac examination was normal. His abdomen examination showed a negative Murphy sign. There was no abdominal tenderness in all quadrants and no muscular defense found in this study. Bowel sound was normal. His extremities showed less than 2 second capillary refill time; no rashes or petechiae are noted. He was able to respond to questions appropriate for his age.

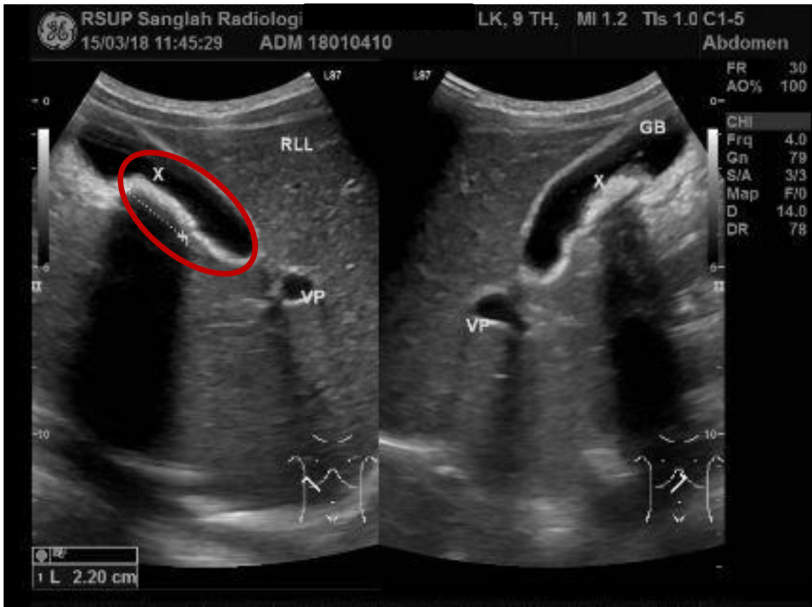
The patient underwent several laboratory examinations. His white blood cell count was elevated at  $20,42 \times 10^3/\mu\text{L}$ , with a normal hemoglobin level at 13,97 g/dL and a thrombocyte level at  $598,70 \times 10^3/\mu\text{L}$ . The differential count shows 12,47% lymphocytes, 79,59% neutrophil, 5,91% monocytes. The Erythrocyte sedimentation rate was 47,2 mm/hour. The results of his liver function test (LFT) were normal. Urine and stool examination were also normal.

The patient was then diagnosed with the observation of abdominal pain because of suspect cholecystitis with well-nourished. The patient was treated with IVFD KaEN 3B 18 dpm and Ceftriaxone 25mg/kg/dose~750 mg every 12 hours administered intravenously. Ultrasonography was ordered and the result was liver, gallbladder, pancreas, both kidneys in normal condition.

The following day the abdominal pain decreased, without nausea nor vomiting. There was no fever found in the patient. Three days after the patient was admitted, the abdominal pain persisted, but the nausea was decreased without vomiting. Omeprazole in a dosage of 1 mg/kg/dose or equal to 28 mg every 12 hours and sucralfate syrup 5 ml every 8 hours was administered to the patient. The patient was reassessed with abdominal pain observation because of cholecystitis differential diagnosed with functional type IBS.

Two days later, the abdominal pain was increased, accompanied by profuse vomiting, and the pain felt the same as the first time he felt it. The following day the patient underwent emergency ultrasonography and was evaluated by a pediatric surgeon. Ultrasonography result was cholelithiasis, free fluid around pelvic region et causa suspect visceral organ perforation. The patient has then diagnosed with observation abdominal pain et causa cholelithiasis.

Seven days after admission, the abdominal pain was intermittent and the pain becomes increased



**Figure 1.** Ultrasonography of the gallbladder found the hyperechoic lesion with acoustic shadow (Red Circle)

**Table 1.** The gallstone analysis of the patient

Macroscopic	
Consistency	Sand-like (soft)
Surface	Not palpable
Color	Yellowish green
pH	6.5
Flame test	Positive
Stone chemical examination	
Oxalate	Positive
Ammonium	Positive
Calcium	Positive
Cholesterol	Positive
Phosphate	Negative
Cystine	Negative
Magnesium	Negative
Uric Acid	Negative
Carbonate	Negative

with palpation; then, the patient was planned for laparoscopy cholecystectomy by a pediatric surgeon. The patient underwent laparoscopy cholecystectomy on the 14th day after admission. It was found yellowish-green gallstone with sand-like consistency and 0,5 grams weight during surgery (Figure 2). A sample of the gallbladder was sent to the pathology anatomy department and analyzed as the results mentioned in Table 1 and Figure 3.

After the surgery, the patient was returned to the ward and fast for at least 8 hours and fully conscious. He went home 3 days after the surgery without complaints with Cefixime and Paracetamol. Seven days after the surgery, the pathology results were out. The result of the pathology anatomy was

described as chronic cholecystitis.

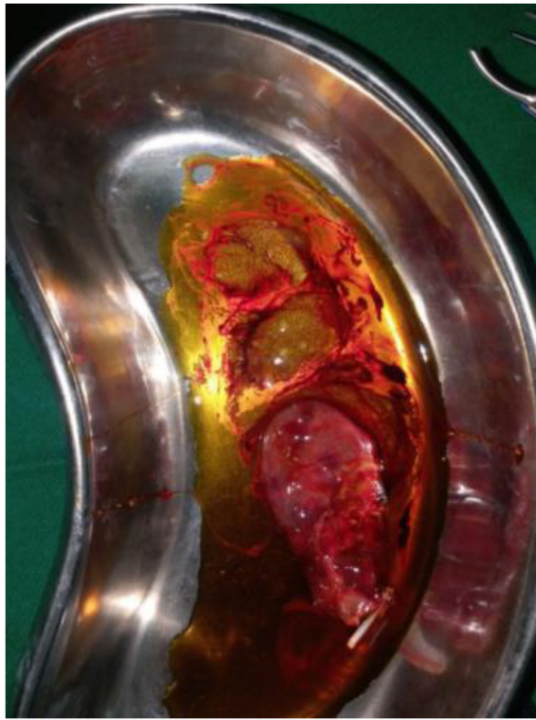
**DISCUSSION**

Cholelithiasis is considered an uncommon condition in children. Recent series document an increasing detection of this disorder; this may be explained by increased abdominal ultrasound scanning in childhood. The frequency of pediatric gallstones reported in studies in which patients were selected according to initial symptoms resulted in a prevalence between 0.13% and 0.22%. In a population-based study, the prevalence of gallstones and biliary sludge in children was 1.9% and 1.46%, respectively.<sup>1</sup> In an analog study performed in Italian adults, the overall prevalence of gallstones diseases was of 9.5% in men and 18.9% in women.<sup>1</sup>

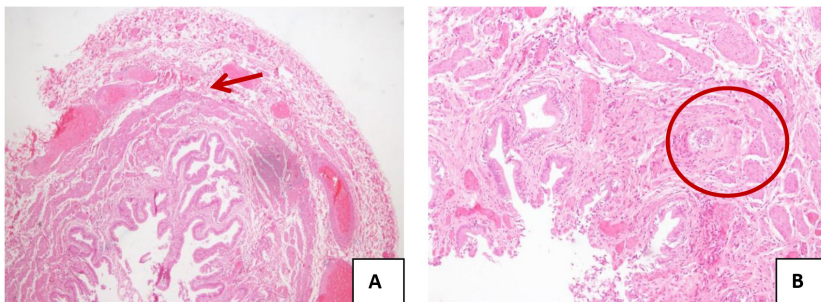
Although part of this observed increase in gallbladder disease in children may be due to the increased awareness and detection secondary to the increasing use of abdominal ultrasound, a significant component of the increase is likely real, caused by a rise in childhood obesity and diabetes, as well as the lithogenic qualities of the modern diet. Moreover, children who have gallbladder disease may be most likely to come to medical attention, with only 33% of children asymptomatic compared with 80% of adults.<sup>9</sup> The risk factors responsible for the development of gallbladder disease were age, female gender, obesity, positive history of cholelithiasis, prematurity, and ethnicity.<sup>10,11</sup> The mean age was 8 to 12 years old. The phenomenon was suggested and attributed to biliary cholesterol saturation occurring secondary to hormonal changes during puberty. Hormonal changes occurring during puberty may contribute to the impairment of gallbladder motility in biliary dyskinesia by altering the lipid composition of bile, increasing cholesterol saturation, and promoting gallbladder hypomotility.<sup>11</sup> In this case, despite the patient being male with good nutritional status (not obese), the patient was in the mean age identified as key contributors to this disease.

It was previously reported that approximately 80% of adults with gallstones are asymptomatic. Instead, we have found that only one-third of children with cholelithiasis were asymptomatic. This could be explained by the tertiary nature of involved centers or may indicate that asymptomatic cholelithiasis is less frequently in children, as described in other studies.<sup>1</sup> Preoperative symptom that was considered consistent with a possible inflammatory process included abdominal pain, subjective fever and chills, nausea, emesis, and inability to tolerate a diet. Clinical findings considered to be consistent with an inflammatory





**Figure 2.** Clinical Picture of the gallstone



**Figure 3.** Anatomical Pathology results showed chronic cholecystitis. A) Polymorphonuclear such as neutrophil, lymphocyte, and plasma (Red Arrow); B) Rokitansky Aschoff Sinus (Red Circle)

biliary process included right upper quadrant or epigastric tenderness, fever, an elevated white blood cell (WBC) count, or radiographic imaging (ultrasound, CT, or HIDA) that indicated an inflammatory process.<sup>12</sup> Laboratory testing in the child with suspected biliary colic or acute cholecystitis should include a complete blood cell count, LFTs, and lipase. It is important to remember that normal white blood cell counts, LFTs, and pancreatic enzymes do not rule out gallbladder disease.<sup>9</sup> In this case, the patient came to the pediatric emergency department Sanglah Hospital with chief complaints of abdominal pain in the epigastric region, nausea and emesis, with elevated white blood cell count and high ESR (erythrocyte sedimentation rate) that was indicative of inflammatory process such as cholecystitis.

In the last years, following the extensive use of ultrasound scanning, an increasing number of children with cholelithiasis have been identified.<sup>1</sup> The transabdominal ultrasound examination is the most commonly used screening modality. In patients who present with symptoms attributable to gallstone disease, USG may be the only radiology study ordered. It has the advantages of being widely available, non-invasive, and inexpensive. Ultrasonography, however, is highly operator dependent, but it can provide useful information in experienced hands. A common bile duct diameter of greater than 6 mm on ultrasonography is associated with a higher prevalence of choledocholithiasis.<sup>13</sup> Ultrasound is 95% accurate for identifying cholelithiasis in the general population. Gallstones appear as echogenic foci within the gallbladder; unlike polyps, they should settle (or rarely float) with patient position changes.<sup>14</sup> Finally, to achieve absolute diagnostic certainty, gallstones larger than 3 mm should be observed casting a shadow; this effect can often be achieved by repositioning the patient and the transducer. Occasionally, stones may be accompanied by layering gallbladder sludge.<sup>9</sup> In this case, the patient had 2 ultrasonography examinations. The first time was normal, but the second time, cholelithiasis was found with free fluid around the pelvic region caused by a suspect of visceral organ perforation.

The technological accuracy of magnetic resonance cholangiopancreatography (MRCP) rivals that of endoscopic evaluation.<sup>15</sup> The diagnostic accuracy of MRCP in patients with choledochal cysts and stenoses has been reported to be 100%. In contrast, its sensitivity and specificity in detecting choledocholithiasis have been reported to be 88% and 96.8%, respectively.<sup>15</sup> The role and value of Endoscopic Retrograde Cholangiopancreatography (ERCP) is the gold standard of diagnostic value in the pediatric age group is not well established. Besides being an operator-dependent and invasive procedure, it has its own complications and limitations. However, it has been reported to have a high success rate even in children provided experienced endoscopists perform it. The delicate delineation of ERCP's anatomy and its therapeutic potential make it superior to other less invasive tools such as MRCP.

On the other hand, some studies concluded that ERCP in the pediatric population had a much higher complication rate compared to adults (33.3%), even inexperienced hands, and advocated that the risk and benefits should be carefully reviewed before proceeding.<sup>16</sup> In this case, the patient underwent 2 times transabdominal ultrasonography examination to confirm the diagnosis. MRCP or

ERCP was not conducted because the patient had already had a positive diagnosis by ultrasound and proceeded to the appropriate management.

The frequency of hospital admission and operation for gallstones increased in Western countries since the 1950s. Children presenting with biliary colic without evidence of cholecystitis may be treated symptomatically with pain medication, diet modification, and outpatient follow-up for surgical evaluation.<sup>17</sup> However, those with ultrasound evidence of cholecystitis or those with severe pain, inability to tolerate oral intake or systemic illness should be admitted for surgical evaluation. In these patients, intravenous hydration, aggressive pain control, and intravenous antibiotics are critical aspects of therapy.<sup>9</sup> Common indications for surgical treatment for cholelithiasis include biliary colic, acute cholecystitis, gallstone pancreatitis, and other presentations of choledocholithiasis, including bile duct obstruction and cholangitis.<sup>13</sup> Guidelines for the management of cholelithiasis are available for adults. Cholecystectomy is recommended for symptomatic patients and those asymptomatic with a predisposition for malignancy (calcified gallbladder wall or family history of gallbladder cancer).<sup>18</sup> For asymptomatic patients, expectant management with periodical clinical and echographic controls is recommended. On the contrary, little is known about the natural history and management of cholelithiasis in childhood. So far, guidelines for the management of children with gallstones are lacking. Surgical options for pediatric cholelithiasis include open or laparoscopic cholecystectomy.<sup>19</sup> A previous study found that laparoscopic cholecystectomy was performed more frequently in younger than older patients (100% in children  $\leq 5$  years old).<sup>19</sup> The mortality rate being higher in males (0.22 vs. 0.15) and rising with increasing age ( $p < 0.05$ ). There were shorter hospital stays needed after laparoscopic surgery. The laparoscopic procedure reduces the probability of all the complications analyzed. In conclusion, this journal showed that performing laparoscopic cholecystectomy is effective and safe even for children.<sup>19</sup>

At present, the laparoscopic technique is considered the gold standard for cholecystectomy in children for reduced pain, absence of an upper abdominal incision and scar formation, and a shorter period of hospitalization.<sup>1</sup> Laparoscopic cholecystectomy has been shown to decrease pain and length of hospital stay in pediatric patients compared with open cholecystectomy.<sup>9</sup> In this case, laparoscopic cholecystectomy was performed, and the patient was discharged 3 days after surgery.

Blackwood et al. found an inaccuracy in preoperative ultrasound in pediatric patients' diagnostic work for inflammatory gallstone disease.<sup>20</sup> About 95.3% of their study patients underwent a preoperative ultrasound that was read as cholelithiasis without signs of either acute or chronic inflammation.<sup>20</sup> The pathology results, 157 patients (92%) had pathologic evidence of inflammation (87.1% chronic, 5.2% acute).<sup>20</sup> This represents a sensitivity of approximately 5%, which is not diagnostically helpful useful as the number of pediatric patients with cholecystitis increases. A recent study found that ultrasound findings have sensitivities as low as 6% for cholecystitis in the pediatric population than the adult population where sensitivities are as high as 96%.<sup>20</sup> In this case, as described on pathology anatomy result, chronic cholecystitis was not found pre-operatively because of the same reason. It is difficult to diagnose it with ultrasound.

Complications associated with cholecystectomy were also explained in the previous study.<sup>21</sup> This journal concluded that complications include hemorrhage, infection, bile duct injury, ileus, pancreatitis, and post-cholecystectomy syndrome.<sup>21</sup> The term post-cholecystectomy syndrome (PCS) describes the presence of symptoms after cholecystectomy.<sup>21</sup> These symptoms can represent either the continuation of symptoms thought to be caused by gallbladder pathology or the development of new symptoms generally attributed to the gallbladder. PCS also includes developing symptoms caused by removing the gallbladder (e.g., gastritis and diarrhea).<sup>21</sup> In this case, the patient had no sign of infection after the surgery and did not complain of any sign of nausea and emesis.

## SUMMARY

A ten-year-old boy presented with nausea, umbilical pain, and emesis. Physical examination shows there is no tenderness in all quadrant with a negative Murphy sign. Laboratory results show elevated white blood cell count  $20,42 \times 10^3/\mu\text{L}$ , elevated erythrocyte sedimentation rate 47,2 mm/hour, normal LFT, urine, and stool sample. He underwent 2 times transabdominal ultrasound; the latest showed cholelithiasis, free fluid around the pelvic region, et causa suspect visceral organ perforation. Laparoscopic cholecystectomy was done without complication. The patient was discharged 3 days after surgery in good condition. There is no early complication after the surgery. The result of the pathology anatomy was described as chronic cholecystitis. The prognosis of the patient is good.

## CONFLICT OF INTEREST

There is no competing interest regarding the manuscript.

## ETHICS CONSIDERATION

The authors declare that the ethics approval has been obtained from the Ethics Committee, Faculty of Medicine, Universitas Udayana, Bali prior to the study being conducted.

## FUNDING

None

## AUTHOR CONTRIBUTIONS

All authors equally contribute to the study by selecting cases, evaluating the outcome, and reporting the study results through publication.

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