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Risk factors for symptomatic gallstones in children: A single-center experience

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Abstract

Objectives: The objective of the study was to evaluate the demographic characteristics and possible additional risk factors for cholecystitis in patients who applied to a pediatric surgery clinic with symptomatic cholelithiasis and underwent cholecystectomy.

Patients and methods: The retrospective study included 28 pediatric patients (8 males, 20 females; mean age: 15.4±2.4 years; range, 13 to 17 years) who underwent cholecystectomy due to symptomatic cholelithiasis between March 2020 and March 2025. Demographic characteristics, body mass index (BMI), family/personal history, clinical data (symptoms at diagnosis), laboratory tests (hemolytic screening, inflammatory markers, and liver function tests), imaging results, and pathology records of the patients were reviewed.

Results: The mean BMI was 25.7±5.09 kg/m^2 (range, 18.9 to 37.0 kg/m^2), with BMI >25 kg/m^2 in 19 (67.8%) patients. No hematological disease was detected in any of the patients. Laparoscopic cholecystectomy was performed in all patients. Histopathological examination of the specimens taken from the patients revealed chronic cholecystitis and cholesterol stones in the gallbladder lumen of all patients.

Conclusion: The present study indicated that obesity and the female sex may be risk factors for cholelithiasis in children. Future studies are needed on this subject.

Keywords: Children, cholecystectomy, cholelithiasis, obesity.

Gallstones are a relatively rare condition in pediatric patients.[1] Nonetheless, the incidence of pediatric gallstones and cholecystectomies have been increasing in recent years.[2] It is known that cholelithiasis is often related to hemolytic diseases, total parenteral nutrition, some surgical procedures, and drugs in children.[3] In adults, obesity, female sex, age <40 years, and rapid weight loss are additional risk factors for cholelithiasis and cholecystitis.[1-4] While cholecystectomy is also becoming more frequent in childhood,[4] it is not clear whether gallstone risk factors established for adults also apply to pediatric populations.[5] Over the past few years, a significantly higher incidence of cholelithiasis has been observed in obese and diabetic children.[3,4] Given the observations that the prevalence of dyslipidemia and diabetes is also increasing in pediatric populations,[5] pediatricians may have to be increasingly prepared to recognize and treat conditions in children that traditionally only occurred in adults. Results from small hospital-based studies suggest that obesity may be a risk factor for gallstones in adolescents.[1-4] However, there are very few studies on the additional risk factors for gallstone disease and cholecystitis in childhood. There is a paucity of data on this topic, and comprehensive studies are needed. Hence, this study aimed to evaluate the demographic characteristics and possible additional risk factors for cholecystitis in pediatric patients who underwent cholecystectomy due to symptomatic cholelithiasis.

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PATIENTS AND METHODS

The retrospective, descriptive study included 28 pediatric patients (8 males, 20 females; mean age: 15.4±2.4 years; range, 13 to 17 years) who underwent cholecystectomy at the

Sancaktepe Şehit Prof. Dr. İlhan Varank Training and Research Hospital, Department of Pediatric Surgery, between March 2020 and March 2025. Demographic characteristics, body mass index (BMI), family/personal history, clinical data (symptoms at diagnosis), laboratory tests (hemolytic screening, inflammatory markers, and liver function tests), imaging results, and pathology records of the patients were reviewed. All patients who underwent cholecystectomy due to symptomatic cholelithiasis during the study dates were included in the study. Patients receiving total parenteral nutrition, those who had previous abdominal surgery, those with a history of lithogenic therapy (ceftriaxone, rifampin, and octreotide), and those previously diagnosed with hematological diseases were excluded from the study. Data was collected from the hospital's electronic records using a standardized form and stored on a secure cloud-based system for analysis. Acute cholecystitis was defined as right upper quadrant pain, fever, nausea associated with eating, and presence of right upper quadrant tenderness on physical examination. Written informed consent for the surgical procedure was obtained from the parents of all patients. The study protocol was approved by the Sancaktepe Şehit Prof. Dr. İlhan Varank Training and Research Hospital Ethics Committee (Date: 28.08.2024, No: 2024.270). The study was conducted in accordance with the principles of the Declaration of Helsinki.

All patients were examined by a senior pediatric surgeon. All patients underwent abdominal ultrasonography. Magnetic resonance imaging was performed in three patients who had previously undergone endoscopic retrograde cholangiopancreatography (ERCP). All patients were evaluated by the pediatric hematology department for possible hematological disease. Body mass index was calculated, and obesity was considered a BMI >25 kg/m^2.

Indications for surgery were patients with calculous cholecystitis who had at least one attack and obstructive jaundice or whose symptoms (pain, feeling of bloating) continued despite at least six months of medical treatment with ursodeoxycholic acid (10 mg/kg twice a day). Cholecystitis was diagnosed based on laboratory ultrasound findings and physical examination. The surgical procedure was performed via open transumbilical access, two operative trocars, and one accessory trocar, and the cystic artery and cystic duct were ligated with the help of metal clips. A low-fat diet was recommended to each patient with clinical and ultrasound controls after six and 12 months follow-up.

Statistical analysis

All statistical analyses were performed using IBM SPSS version 22.0 software (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as median ± standard deviation, and categorical variables were expressed as frequency (%). As the study was purely descriptive no further statistical analysis was performed.

RESULTS

The mean BMI was 25.7±5.09 kg/m^2 (range, 18.9 to 37.0 kg/m^2), with BMI >25 kg/m^2 in 19 (67.8%) patients. Regarding the clinical presentation, 21 children were admitted to the emergency service with an acute cholecystitis attack, three patients had obstructive jaundice, and four patients had pain at the right upper quadrant and a feeling of bloating. Two patients had a family history of cholecystectomy due to gallstones. No hematological disease was detected in any of the patients.

No emergency cholecystectomies were performed. Patients who presented with cholecystitis attacks underwent cholecystectomy six to eight weeks after conservative treatment.

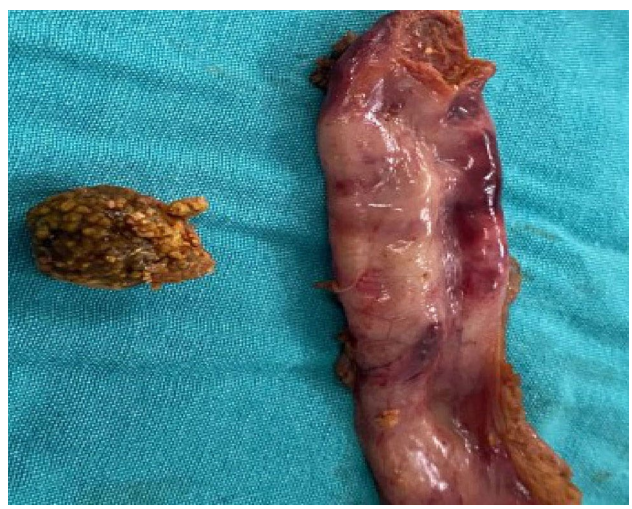

Figure 1. Intraoperative image of a patient with intraluminal cholesterol stone.

Patients who presented with obstructive jaundice underwent cholecystectomy six to eight weeks after ERCP.

Laparoscopic cholecystectomy was performed in all patients. Histopathological examination of the specimens taken from the patients revealed chronic cholecystitis and cholesterol stones in the gallbladder lumen of all patients. Figure 1 demonstrates the intraoperative image of a patient with an intraluminal cholesterol stone.

DISCUSSION

Gallstones are often associated with hematological diseases in children.[1-4] Some studies have reported that cholecystectomies for gallstones have significantly increased in children.[2,5] Pogorelić et al.[2] showed a threefold increase in the number of cholecystectomies for gallstones over the past decade compared to the previous decade. Similarly, Walker et al.[6] reported a 213% increase over a nine-year period.

In recent years, it is claimed that obesity is an important risk factor in children as well as adults.[3,4] Additionally, studies report that patients with gallstones have a significantly higher BMI than the general population.[1,4] Similarly, our study found a mean BMI of over 25, with nearly 70% of patients classified as being obese (BMI >25). The etiology of gallstones in these patients is the supersaturation of bile due to excess cholesterol in the gallbladder.[3] In our study, although we were not able to include a control group, we found that the BMI of our patients were higher than the normal population, and most of our patients were obese. In addition, postoperative pathological examination revealed that the stones in the gallbladder were cholesterol stones. Hematological evaluation revealed no diagnosis of hematological disease. Therefore, we believe that obesity, which is increasing in society, may be one of the most important reasons for the increase in gallstones in childhood.

It is known that the female sex is a risk factor for gallstones in adults.[4] Studies on gallstones not associated with childhood hematological diseases have reported that gallstones are more common in girls.[1-7] Todesco et al.[4] reported that 76.5% of their patients were female in pediatric patients group; Mehta et al.[8] reported this rate to be 73%. Additionally, some researchers have suggested that the traditional surgical aphorism for the cause of gallstones should be rephrased as "female, fat, and fifteen."[4,9] Similarly, in our study, we found that the female sex was more prevalent. We believe that our study indicates that the female sex may be an additional risk factors for gallstones in childhood, as in adults.

The study's limitations were that it was retrospective and that the data were obtained from hospital's medical records. As the study was completely descriptive and retrospective in nature, no control group was included. Further studies comparing healthy nonobese children with obese children with regard to the incidence of acute cholecystitis would be valuable.

In conclusion, the present study indicated that obesity and the female sex may be risk factors for symptomatic cholelithiasis in children. Future studies are needed on this subject.

Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Author Contributions: Idea/concept, design, critical review: S.S., F.A.C.; Data collection and/or processing: S.S., G.K.K.; Analysis and/or interpretation: S.S., G.G.; Literature review, writing the article, control/supervision: S.S.; References and fundings: G.G., G.K.K.

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