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Research Article

Symptomatic Gallbladder Stones: From Occasional to Everyday in Pediatric Surgery

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Abstract

Introduction: Gallbladder stones (GS) in children were once considered rare. In recent years, the rate of cholecystectomies appears to have increased. GS may present with symptoms in 60% of cases and can be simple GS (biliary colic) or complicated GS (cholecystitis, pancreatitis, choledocholithiasis). Laparoscopic cholecystectomy (LC) is the treatment of choice. The disease often leads to multiple emergency department visits and even hospitalizations, generating an increase in morbidity and public health costs. The objective of this study is to evaluate the clinical presentation, risk factors, complications, treatment, and evolution of GS in children.

Materials and Methods: Retrospective, cross-sectional study in children from 0 to 14 years of age, who underwent cholecystectomy for symptomatic GS at the Hospital Nacional Prof. A. Posadas between January 2018 and July 2022 (54 months).

Results: A total of 219 LCs were performed, 36 (2018), 39 (2019), 36 (2020), 62 (2021) and 47 (first half of 2022) in patients with a mean age of 12.3 years (3-14), 68% female, 25% overweight, 23% obese, 86 patients with family GS. 36% complicated GS (CGS); 29 patients presented cholecystitis, 26 choledochal syndrome, and 33 pancreatitis. 15% had 3 or more consultations prior to surgery and 12% began as biliary colic and later presented CGS. 62% of patients with cholecystitis presented microlithiasis as an ultrasound finding and 88% of patients with pancreatitis presented microlithiasis. ERCP was required in 17 patients, IOC in 6 (2.7%), Rendez Vous in 3 (1.37%). 21 patients (9%) with postoperative complications were reported, of which 1 required relaparotomy.

Conclusions: The incidence of GS has increased considerably in the period studied. The data suggest that poor diet and family GS are factors to be considered in its development. Finally, the time of evolution and the delay in surgical resolution has led to a higher prevalence of CGS in our population, which is why we believe that patients with symptomatic GS should be operated on after diagnosis.

Keywords: *Gall blader stones; Pediatric surgery; Cholecystectomies; Symptomatic GS*

Highlights

The study found that the incidence of GS in children has increased significantly in recent years. This is likely due to a number of factors, including:

- Increased obesity rates: Obesity is a major risk factor for GS in both children and adults.
- Dietary changes: Children are increasingly consuming a diet that is high in unhealthy fats and sugar, which can also contribute to GS development.
- Genetic predisposition: Some children are more genetically predisposed to developing GS than others.

- The study also found that the majority of children with GS presented with symptoms, such as abdominal pain, nausea, and vomiting. However, some children did not have any symptoms, which can make it difficult to diagnose the disease.
- The most common complications of GS in children were cholecystitis (inflammation of the gallbladder), pancreatitis (inflammation of the pancreas), and choledocholithiasis (gallstones in the bile duct). These complications can be serious and require hospitalization.
- The treatment of choice for GS in children is laparoscopic cholecystectomy. This is a minimally invasive surgery that involves removing the gallbladder.
- The study's findings suggest that children with symptomatic GS should be evaluated for surgery as soon as possible. This is because the longer the child waits to have surgery, the more likely they are to develop complications.

Introduction

Gallbladder lithiasis (VL) in pediatrics has been considered rare, linked to hemolytic diseases. In recent years, the rate of cholecystectomies seems to have increased, as has the incidence of pediatric obesity, a factor that is impressive to be involved in. In Argentina, the rate is high, with 34% of children reported to be overweight and obese[1]. The incidence of VL is currently 0.15% to 1.2%[2]. Gallstones are produced by oversaturation of bile content. These can be pigmented or non-pigmented (85%). Pigmented stones are caused by increased hemoglobin release, which results in increased bilirubin. The latter correspond to excess cholesterol. Transabdominal ultrasound is the diagnostic method of choice with a sensitivity and specificity greater than 95% to detect gallstones[3]. The positive predictive value of ultrasonography added to the safety of the method and easy access allows the diagnosis of the pathology. VL can present with symptoms in 60%[4] of cases and can be simple VL (biliary colic) or complicated (cholecystitis, pancreatitis, choledocholithiasis). Laparoscopic cholecystectomy (LC) is the treatment of choice. The disease usually leads to multiple on-call visits and even hospitalizations, generating an increase in morbidity and public health costs. The objective of this study is to evaluate the clinical presentation, risk factors, complications, treatment and evolution of VL in children.

Materials and Methods

Retrospective, cross-sectional study in children from 0 to 14 years of age, cholecystectomized for symptomatic VL at the Hospital Nacional Prof. A. Posadas (HNAP) between January 2018 and July 2022 (54 months).

The information was obtained from reviewing hospital medical records and telephone calls to patients. Four patients were excluded from the total due to impossibility in data collection and those patients with asymptomatic VL.

The diagnosis of VL was made in the emergency area of the HNAP and/or in the scheduling office of the pediatric surgery service.

The diagnostic algorithm used resulted from the sum of clinical data, laboratory data with hepatogram and hepatobiliary ultrasound.

Laparoscopic cholecystectomy was the technique used in the entire population. Postoperative treatment as well as follow-up was based on international standards and care protocols of the service.

Quantitative and qualitative variables were analyzed.

The quantitative variables analyzed were: age (years), weight (kg), time of evolution (months), pre- and postoperative hospitalization time, consultations prior to surgery, ultrasound findings (size of the stone), and direct bilirubin.

Qualitative variables to consider: comorbidities, familial lithiasis, mode of presentation, intrasurgical findings, procedures performed (intraoperative cholangiography, rendezvous and ERCP) and postoperative complications.

Qualitative variables were summarized through absolute frequency and percentage. Quantitative variables were summarized through proportions, differences in proportions. A double entry table was made to compare results.

Postoperative complications were analyzed using the Clavien dindo classification of postoperative complications according to grades. (Table 1.)

Table 1	CLAVIEN DINDO surgical complications classification.
GRADE	**DEFINITION**
GRADE 1	Any deviation from the normal postoperative course that does not require reoperation under general anaesthesia or endoscopic intervention. It is considered to include the use of electrolyte solutions, antiemetics, antipyretics, analgesics, and physiotherapy. Includes superficial infection treated at the patient's bedside.
GRADE II	Requires pharmacological treatment other than the aforementioned. Use of blood transfusions or blood products and parenteral nutrition.
GRADE III III a III b	Requires radiological or endoscopic intervention (not surgery). -Without general anaesthesia. -With general anaesthesia.
GRADE IV IV a IV b GRADE V Suffix "d"	Life-threatening complications that require care in an intensive care unit or intermediate care unit. - Simple organic dysfunction (including dialysis). - Multiple organ failure. Death Post discharge COMPLICATION. Suffix is accompanied by a number, representing the number of days post discharge.

Results

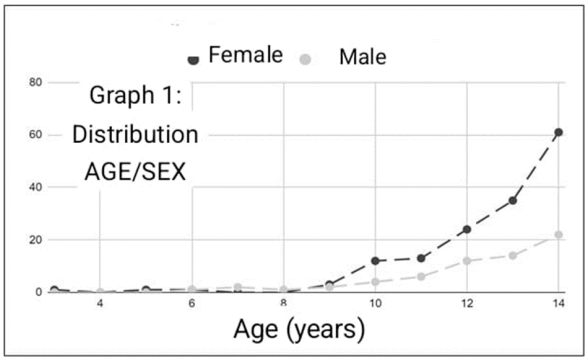
A total of 219 patients with a mean age of 12.3 (3-14) years were included. median 13, mode 14. The incidence was higher in patients aged 14 years. (37%) (Graph 1.)

The prevalence was 68% (148 patients) for females and 31% (71 patients) for males. (Figure 1.). The presence of 1st or 2nd degree relatives with VL was 39% (86 patients).

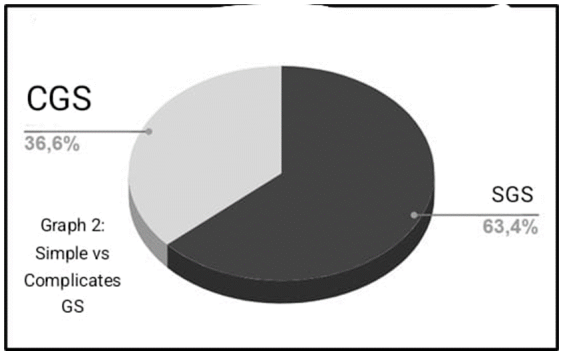
Simple VL corresponds to 64% (137 patients) and complicated VL to 36% (79 patients). Of the latter, 29 presented cholecystitis, 26 had common bile duct syndrome, and 33 had pancreatitis (19 mild, 8 moderate, and 6 severe). (Graph 2 and 3.).

Of the overweight or obese patients, 36% had complicated LIVE. 12% of patients with simple VL presented associated complications during their course. 95% of these patients were adolescents and the majority consulted more than 1 time in a pediatric emergency (90%).

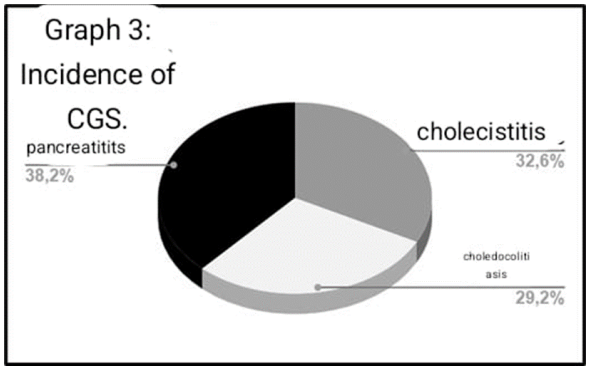
The average evolution time prior to the consultation was 4.3 months. 15% had 3 or more consultations prior to surgery.



Graph 1: *Distribution according to sex-age.*



Graph 2: *Simple Vs Complicated Cholecystitis.*



Graph 3: *Incidence of complicated Cholecystitis.*

Regarding ultrasound findings, 62% of patients with macrolithiasis (stones > 2 mm) presented cholecystitis and 88% of patients with pancreatitis presented microlithiasis as an ultrasound finding. 56% of the complicated forms of the disease presented ultrasound microlithiasis.

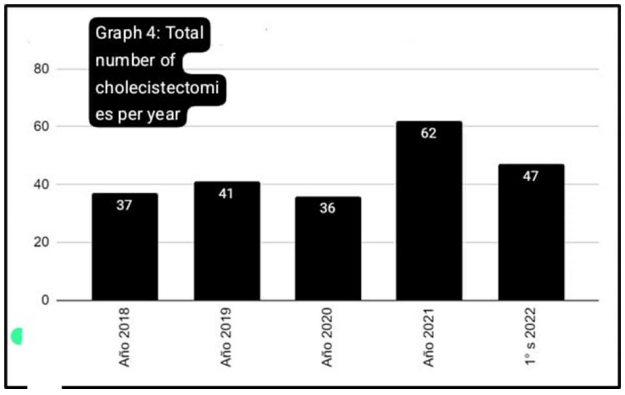
Bile duct instrumentation procedures were carried out in 23 patients (10%), 17 ERCP (8%) and 6 IOC (2.7%). Their indication was subject to unresolved common bile duct syndrome or anatomical variants of the vb.

The preoperative hospitalization time was an average of 4 days (0-68) and postoperative 1.4 (0-10) days. 70% a single day. 82% of those without complications vs 48% in complicated VLs achieved hospital discharge in 24 hours.

Postoperative complications in 21 patients (9%) (13 correspond to patients with complicated VL and 8 simple VL): IACS 2 (G I), Surgical wound granuloma (G I): 1, Hematoma (G I): 1, Wound infection (G I): 5, Residual lithiasis (III B/IIIBd): 2 (pac with complicated LV CTA), Bleeding: 2 (1 requiring relaparotomy (IIIB) and 1 transfusion (II)). 90.5% of them were over 11 years old. We did not have bile duct injuries in the period studied.

Discussion

At our institution, the number of cholecystectomies has doubled in recent years (36 in 2020 vs 62 in 2021). (Graph 4.) The factors related to this fact appear to be multiple.



Graph 4: *Cholecystectomy performed per year.*

One of these is the use of abdominal ultrasound as a complementary method since 1970. Another factor to consider is childhood obesity, a growing health problem. Almost half of our cholecystectomized patients were overweight (23%) or obese (25%) at the time of diagnosis. In a case-control study in New York, Fradin concluded that for every 1% increase in the rate of childhood obesity, the rate of hospitalization for gallstones increased by 0.65/100,000 children [5]. He also found that being overweight or obese during childhood or adolescence is associated with two to four times the probability of suffering from gallbladder disease [6].

The incidence of complicated VL was higher (36%) compared to the international literature (15-25%) [7-8]. (Graph 2)

Regarding obesity and complicated VL, Frybova et all compared BMI in patients with simple vs. complicated VL and saw a higher rate of obesity in those with complicated VL [9]. In our study, 39% of the population with complicated VL has this associated comorbidity.

Some studies suggest that pancreatitis is the most common presentation of complicated VL, while others have found common bile duct Sme or cholecystitis more frequently [10-11-12]. In our case, pancreatitis was the most common presentation (38.2%). (Graph 3.)

There is a clear distribution by sex with a prevalence of 71% in women, and it can be considered a risk factor for cholelithiasis mainly from pubertal age 13, coinciding with the study by Nilssonn et al in 1960, reporting a difference between boys and girls that was evident from the ages of 11 and 12, in which there is a considerable increase in female cases 14. This fact is linked to the supersaturation of bile acids due to estrogenic stimulation in the pubertal period or even in prolonged OAC consumption. The most frequent age of presentation was 14 years (37%), consistent with the literature [13].

12% of the studied population progressed from simple to complicated in the mode of presentation associated with an average preoperative waiting time of 4.3 months. 90% of them had consulted the pediatric emergency room on more than one occasion and 95% of them were adolescents. This result would indicate that simple VL left to chance can become complicated, especially in the adolescent stage. It is estimated that for 10 days of delay in treatment there is a 5% chance of complications. [14] In our case, the delay in surgical resolution is part of a public health problem with long waiting lists. This led to surgeries of greater technical complexity with prolonged pre- and postoperative hospital stay.

Bile duct instrumentation was carried out in 10% of the population. Patients were selected according to previous symptoms (jaundice, choluria and persistent dilation of the bile duct by ultrasound or choledocholithiasis). With this choice we had only 2 patients with residual lithiasis, reducing operative time and the risk of bile duct injury associated with routine bile duct instrumentation. Several studies support this behavior. [15-16]

Postoperative complications occurred in 21 patients (9%), a result similar to other studies [17-18-19]. Only 1 patient required relaparotomy (cause: hemoperitoneum).

Conclusions

We observed a considerable increase in cases in the period studied. The data suggest that poor diet and familial VL are factors to consider in its development. Finally, the time of evolution and the delay in surgical resolution has led to a higher prevalence of VCL in patients, which is why we believe that those patients with symptomatic VL should be operated upon after diagnosis.

Conflict of Interest

The authors declare they have no potential conflicts of interest to disclose.

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