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OUR EXPERIENCE OF PAEDIATRIC GALL STONE DISEASE ABOUT ITS INCIDENCE & AETIOLOGY IN A TERTIARY CARE CENTRE

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Abstract:

Introduction: Paediatric Cholelithiasis is the Emerging concern now a days, our aim of study was to find out the aetiologies and incidence of cholelithiasis among the children visited atour OPD.Gallstones are categorized into several types, including cholesterol, pigment, and mixed stones. Although we have not analysed the Gall Stones to differentiate it. The risk factors for the development of cholelithiasis include age, gender, body weight, comorbidities, diet, and physical activity.

Materials and Methods: This is a retrospective study wherein 100 patients were included who presented with gall stone disease to the department of paediatric Surgery at a IPGMER & SSKMH Kolkata, India from Aug 2022 to Aug 2024. All patients underwent Ultrasound of Abdomen to confirm gall stones. Haematological and biochemistry tests were performed for all the patients who were offered surgery. Genetical (Karyotype) analyses were done in suspected cases of congenital anomalies. MRCP were done in case of CBD dilatation. Haemoglobin electrophoresis was done where haemolytic causes are suspected and where haemolytic causes were found are being excluded from study group. Incidence of gall stone disease were calculated from amongst the total number of admissions of all paediatric surgery patients.

Results: At age and sex distribution chart (Fig2) we can see Mean age is 8.3 with Standard Deviation (SD) ±0.99. Mean age of boys are 5.4 and girls is 2.9. In religion distribution of patients 53% was Muslims and 47% was Hindu patients. The most common causes of cholelithiasis in children include idiopathic disease (40%), parenteral nutrition (21%), obesity (8%), hemolytic disease (7%), Down syndrome (7%), hyperlipidemia (4%), genetic or

familial (4%), biliary duct anomaly (Choledochal cyst) (3%), typhoid (2%), intestinal ascariasis (2%) and hepatitis (2%). Thirteen patients (13%) present with infantile cholelithiasis (Fig-8). Amongst the thirteen patients two patients were at neonatal age group and both had history of NICU admission and Perentral nutrition.

Conclusion: There is no doubt that prevalence of cholelithiasis in children is increasing. The incidence of gallstone disease in children is influenced by both genetic and environmental factors. There is still lack of data on prophylaxis and treatment that would reduce the incidence of cholelithiasis in pediatric patients. It is important to reduce incidence of neonatal sepsis and reduce use of parenteral nutrition or reduce the duration of PN. It is also important to reduce the incidence of obesity and hyperlipidemia in children. Prevention of infectious causes of cholelithiasis. Thalassemia Prevention.

Key Words: GB-Gall Bladder, PN-Parenteral Nutrition, Pt-Patient, OPD-Out Patient Door, USG-Ultrasonography

INTRODUCTION

Gallstones were considered to be uncommon in infants and children but have been increasingly diagnosed in the recent years, mainly due to wide spread use of ultrasonography (USG). In recent years, the prevalence of cholelithiasis has risen and ranges from 1.9% to 4% in children [1].

There are so many theories of gall bladder stone formation. The earlier ones being mainly stasis and or infection, and the later ones including also physio-chemical factors, metabolic disturbances, associated diseases and constitutional susceptibility, and neurogenic - factors. The literature to date would make it appear that there may be several contributing factors, instead of a single outstanding cause like genetic factors, increased liver cholesterol secretion, accelerated growth of cholesterol crystal, impaired Gall Bladder (GB) motility and intestinal factors [2,5]. According to Bailey et al 20-25% of paediatric cholelithiasis is due to haemolytic disease[3]. There are so many other new causes emerges as cause of cholelithiasis in infants and children, these are congenital anomalies of biliary tract prolong fasting associated with hyperalimentation in premature infants and ileal disease. Gall Bladder stones are three types that is pigment stone, cholesterol and mixed stones. Pigment stones are seen in haemolytic disease. Cholesterol stones are caused by genetic and environmental factors. Complications of GB stone disease are cholecystitis, cholangitis and pancreatitis. But again, GB removal can lead to excess flatulence. The reason behind the excess flatulence is excess bile in intestinal

tract, which then lead to increased contractions (peristalsis) and more undigested sugar ending up in the colon. Digestion of sugar by bacteria leads to release of hydrogen and methane gas. Additional foods that are full of refined sugars and food made up of white floor.

AIMS AND OBJECTIVES

The incidence of cholelithiasis is now increasing in children. The aim of the study is to know the incidence of cholelithiasis among all the paediatric patients visiting to our hospital. There are several contributing factors instead of a single outstanding cause for formation of cholelithiasis in paediatric population. So, it appears that more work has to be done before a definite aetiology can be agreed upon. The aim of the study to know the cause and influencing factors for formation of paediatric cholelithiasis and discuss their potential mechanism of formation of cholelithiasis.

MATERIALS AND METHODS

This is a retrospective study wherein 100 patients were included who presented with gall stone disease to the department of paediatric Surgery at a IPGMER & SSKMH Kolkata, India from Aug 2022 to Aug 2024.

All patients underwent Ultrasound of Abdomen to confirm gall stones. Haematological and biochemistry tests were performed for all the patients who were offered surgery. Genetical (Karyotype) analyses were done in suspected cases of congenital anomalies. MRCP were done in case of CBD dilatation. Haemoglobin electrophoresis was done where haemolytic causes are suspected and where haemolytic causes were found are being excluded from study group. Incidence of gall stone disease were calculated from amongst the total number of admissions of all paediatric surgery patients.

Ethical Approval: Approval for the study was granted by Institutional Ethical Committee and permission to analyse data of the patients was taken from Officer-In charge of OPD and IPD record section.

RESULTS AND ANALYSIS

This is a single centre based retrospective study to be performed in the department of Paediatric Surgery, IPGMER & SSKM Hospital, Kolkata (Fig-1) from May 2022 to September 2024. Only patients with cholelithiasis were included in the study and data was collected from Bed Head Ticket, OPD register and cases those comes to OPD. All data after

collection was tabulated and analysed according to study proforma and appropriate statistical method and software. There were 100 patients in the overall study cohort. The majority of patients were male (65%) (Fig-1).

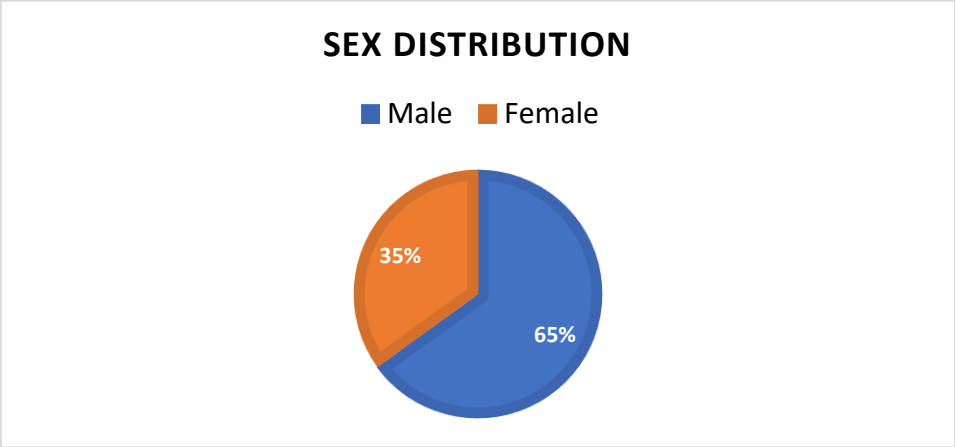

Figure 1: Sex Distribution

At age and sex distribution chart (Fig2) we can see Mean age is 8.3 with Standard Deviation (SD) ±0.99. Mean age of boys are 5.4 and girls is 2.9.

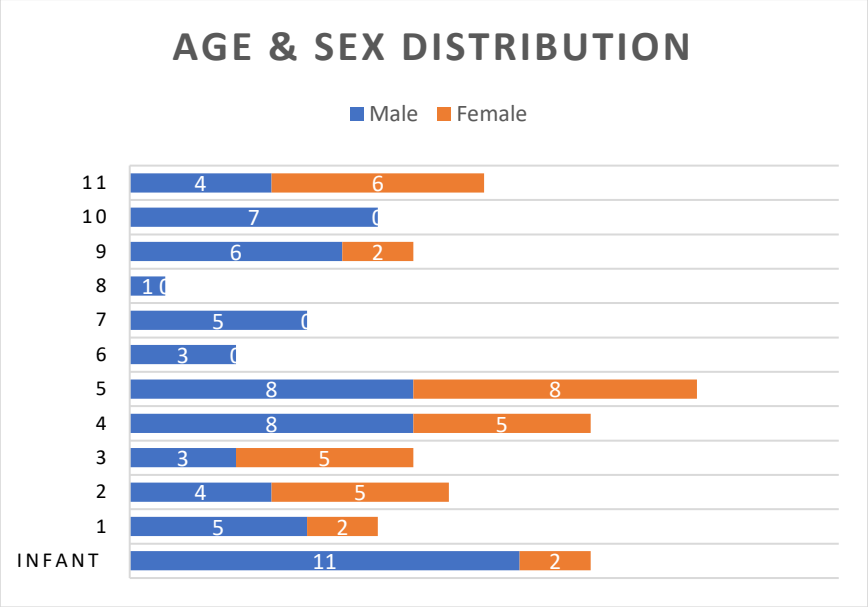

Fig-2: Age and Sex distribution

In religion distribution of patients 53% was Muslims and 47% was Hindu patients.

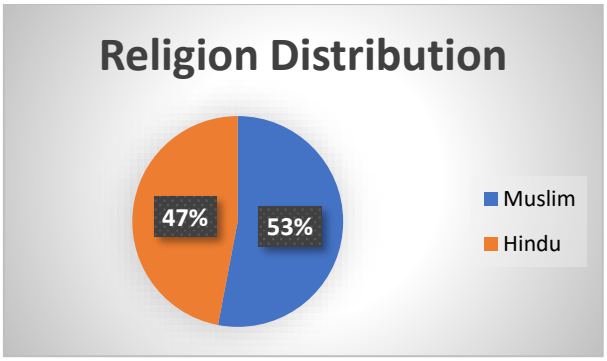

Figure-3: Religion Distribution

Most of the patients are from lower socioeconomic background and mostly from labor class. Regarding residence of the patients most of the patients from Kolkata, South 24 Pargana and Murshidabad district.

The evaluation was done with history taking of child and past, family and treatment history. Regarding symptoms of the patients 39% of patients were symptomatic. The symptoms were pain, vomiting, fever and jaundice.

Symptoms	Number of Patients
Abdominal pain	39%
Vomiting	14%
Fever	6%
Jaundice	10%

Table 1: Symptoms

Congenital anomalies and genetic disease associated with cholelithiasis are Autism, Down syn, Neurological, cardiac anomaly, limb anomaly and biliary duct anomaly (Fig4).

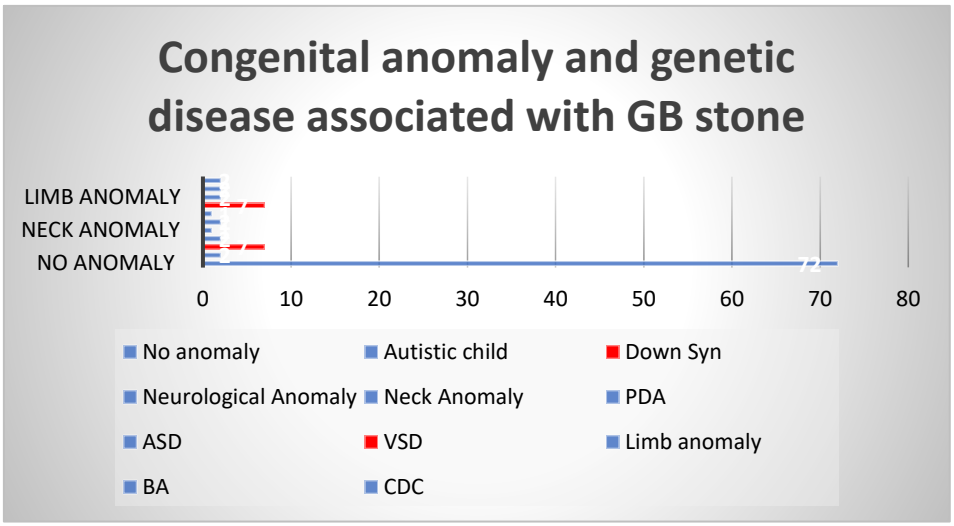

Figure-4: Congenital anomaly and genetic disease associated with GB stone

History of various other organ infections includes plural effusion, gastritis, hepatitis, pancreatitis, cholangitis mesenteric lymphadenitis, colitis, amebiasis and typhoid feverassociated with cholelithiasis (Fig5)

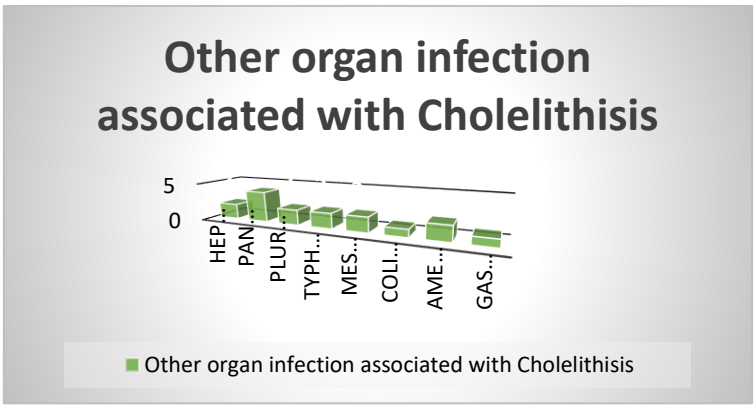

Figure 5: Other organ infection associated with Cholelithisis

In the evaluation we have found different causative factors associated with pediatric cholelithiasis. (Fig-6)

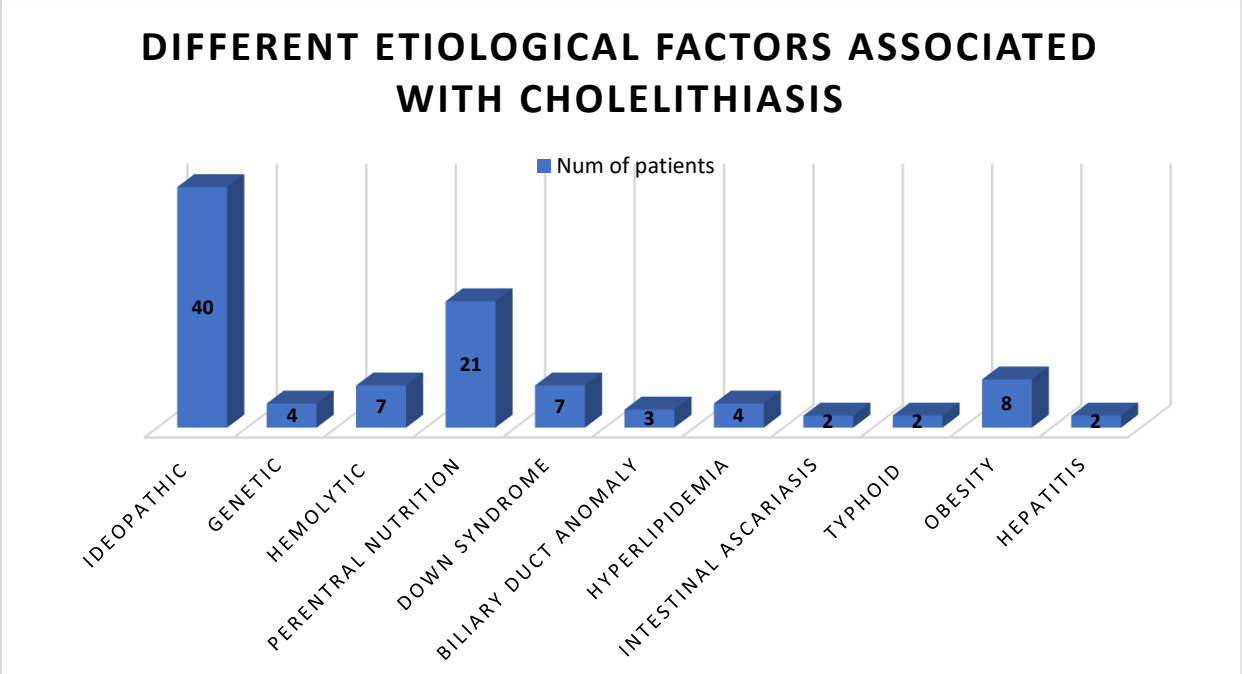

Figure-6: Different etiological factors associated with cholelithiasis

The most common causes of cholelithiasis in children include idiopathic disease (40%), parenteral nutrition (21%), obesity (8%), hemolytic disease (7%), Down syndrome (7%), hyperlipidemia (4%), genetic or familial (4%), biliary duct anomaly (Choledochal cyst) (3%), typhoid (2%), intestinal ascariasis (2%) and hepatitis (2%).

Most of the patients are in idiopathic group with no identifiable risk factors (P<0.012). Data shows in family history in two patients' mother and two patient'sgrandmothers has suffered from cholelithiasis. In hemolytic disease four patients had Thalassemia, two had hemophilia and three were unknown cause of anemia.

Twenty-one patients had history parenteral nutrition and NICU, PICU admission for various reason and was kept NPM for few days (P< .3). Amongst twenty-one patients sixteen patients had history of NICU admission for various reason like – Upper respiratory infection, neonatal seizure, amebiasis, preterm birth, respiratory distress, meconium aspiration, diarrhea andPDA closer at infancy (Fig7).

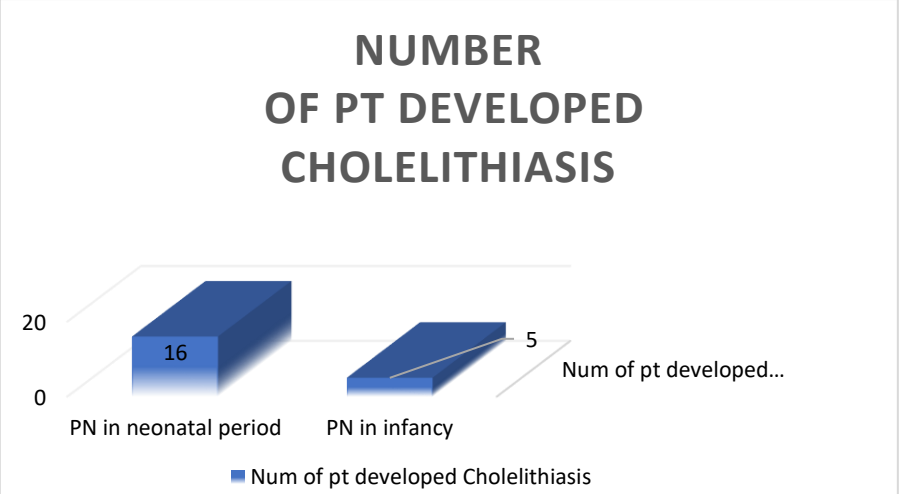

Figure-7: Number of patients developed Cholelithiasis

Thirteen patients (13%) present with infantile cholelithiasis (Fig-8). Amongst the thirteen patients two patients were at neonatal age group and both had history of NICU admission and Perentral nutrition.

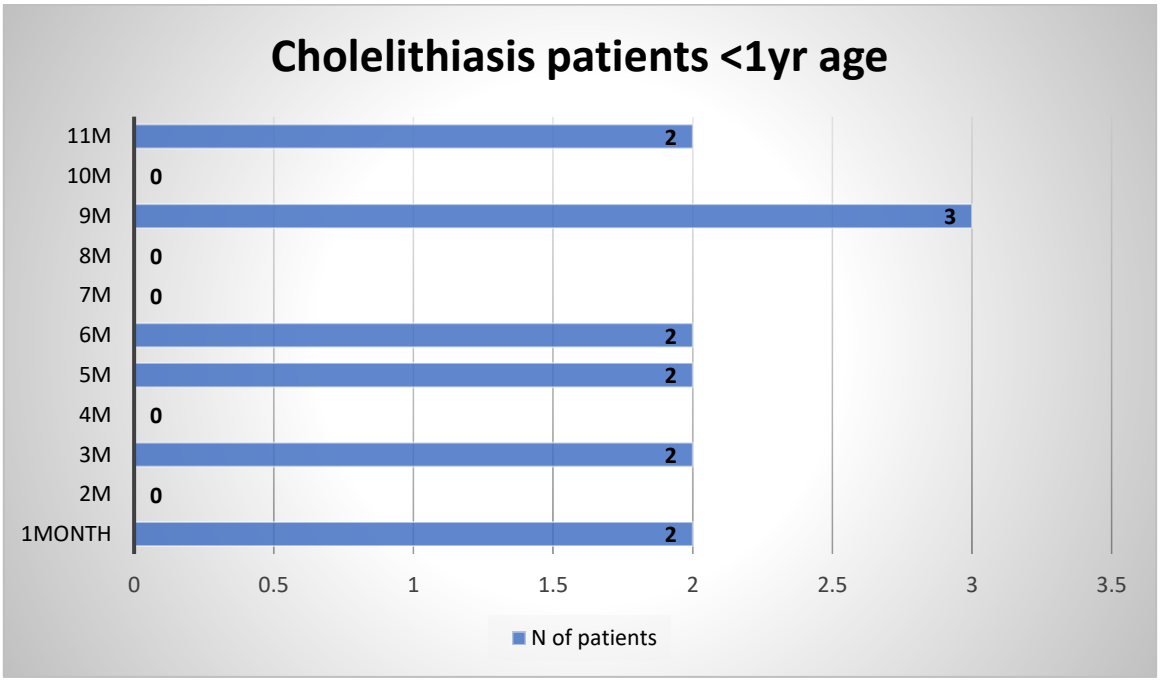

Figure-8: Cholelithiasis patients <1yr age

Out of sixteen patients (16%) with history of NICU admission and Parenteral nutrition two patients (2%) develops Cholelithiasis at neonatal age group itself. Sex distribution ofparenteral nutrition related cholelithiasis (Fig-9).

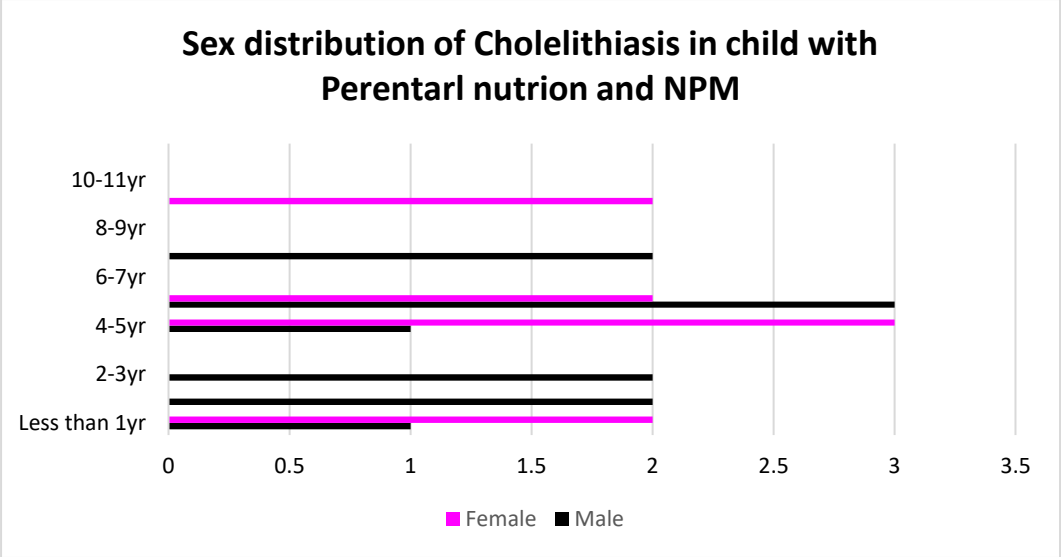

Figure-9: Sex distribution of Cholelithiasis in child with Parental nutrion and NPM

Other associated disease in infantile cholelithiasis Neurological abnormalities, neonatal seizures, limb and neck anomaly VSD, ASD, Down syn, neonatal jaundice, congenital hernia, splenomegaly, hypertrichosis, preterm, anemia and Choledochal cyst.

In obesity related cholelithiasis eight patients were there with average BMI 26.8 ±4.67(SD). Mean age of boys 9yrs and girls 8yrs.

Of the seven boys with Down syndrome with mean age is 3.6 ±1.12(SD) presented with cholelithiasis. Hypercholesterolemia causing cholelithiasis in five patients amongst them two male and two female and both are eleven yrs age. Except a one-year-old male child with hypertriglyceridemia. Biliary duct anomaly includes three patients with choledochal cyst. Various gastrointestinal disease associated with cholelithiasis (Fig-10).

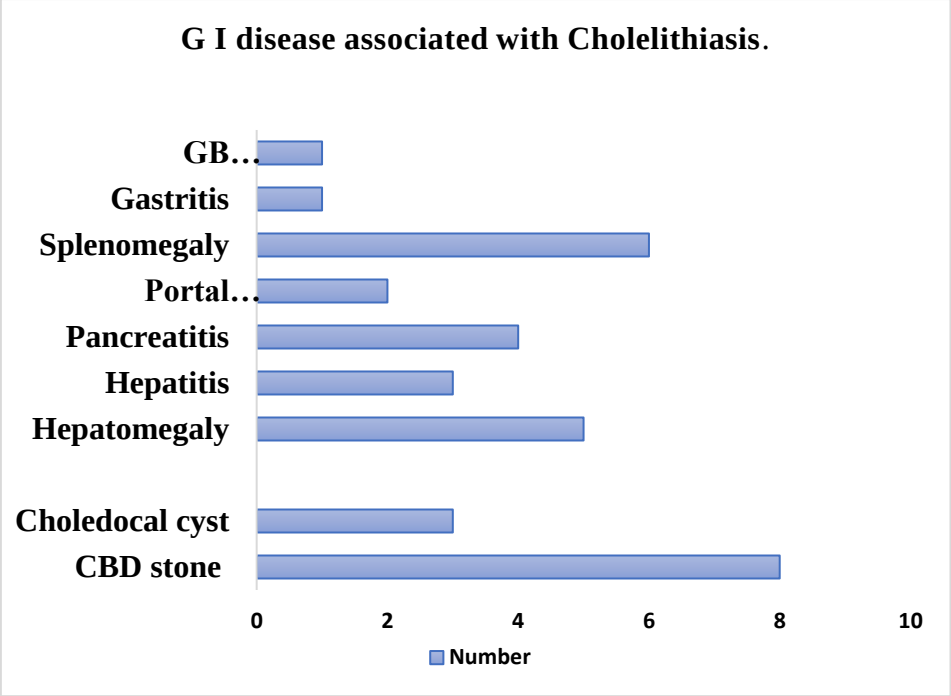

Figure-10: G I disease associated with Cholelithiasis

Incidence we have calculated from our admission book. We have calculated incidence of cholelithiasis among one thousand admitted patient in time period between 2022 august to 2024 august and the incidence is seventeen (17) per one thousand admitted pediatric patients.

DISCUSSION

Cholelithiasis and biliary dyskinesia are being increasingly diagnosed in children. There is a dilemma whether it is increase in the incidence or its being increasingly diagnosed because of increased use of ultrasonography [31]. There are so many studies about the cause of cholelithiasis in children but very less studies about complete demography of aetiologies of cholelithiasis. Here I am presenting my observation about this cause.

Gallstone disease is responsible for about 95% of biliary tract abnormalities. More than half of the cases (in our study 39%) are asymptomatic, usually detected incidentally by an abdominal ultrasound [30]. The changing trend of the disease is haemolytic disease is no longer the prerequisite for development of gall stone. Haemolytic associated cholelithiasis has reduced from 10-15% to 7% [27]. In our study we have identified ten risk or causative factors for formation of cholelithiasis. Those are genetic, haemolytic, parenteral nutrition, Down syndrome, biliary duct anomaly, hyperlipidaemia, infection/infestation, obesity and hepatitis.

In our study we have found 40% of patients don't have any identifiable cause. But study shows idiopathic group is also having risk factors, that is called Low phospholipid associated cholelithiasis (LPAC).

Genetic cause of cholelithiasis has identified when twins show inherited predisposition for cholelithiasis. Lithogenic gene ABCG-5, ABCG-8 (gene related to cholelithiasis), can be inherited to parents to children. Two cases had family history of mother and 2 cases had history of grand-mother being suffered from cholelithiasis.

Mechanism of haemolytic cholelithiasis is more production of unconjugated bilirubin which is lithogenic in nature. Causes of haemolytic cholelithiasis is sickle cell disease, hereditary spherocytosis and thalassemia. Here out of 7 patients 4 patients had thalassemia and other three with unknown cause of anaemia.

In our study 20 patients had history of PN (parenteral nutrition) for various reason. Out of 20 patients 15 patients had history of PN at neonatal age group and 5 patients at infantile age. Human gallbladder normally empties completely after meals. In early age immature biliary system fails to empties the gall bladder along with that lack of enteral stimulation aggravates PN induced cholestasis [32,33,34]. Cholestasis is a commonly described complication of PN and stasis is an essential factor in gallstone formation.

In premature baby proposed mechanisms included altered bile salt metabolisms secondary to prematurity and toxic effect of PN components on the liver and gastrointestinal systems [29]. Intestinal stasis leads to bacterial overgrowth. Endotoxin from gram negative bacteria can inhibit bile secretion leading to cholestasis [35]. Aggravating factors such as sepsis.

PN-related cholestasis was not highly prevalent in our patient population, with only 20% compared to 24% and 35% reported by other authors [36,37]. Seven patients with DS (Down Syndrome) presented with cholelithiasis and our results strongly suggest that paediatric subjects with DS are at increased risk of cholelithiasis. Bocconi et al studied lipid metabolism in DS and showed that trisomy 21 is associated with hypercholesterolaemia during the intrauterine life [38]. Cholelithiasis is often asymptomatic or associated with non-specific symptoms (abdominal pain, vomiting, and fever). Complications including acute cholecystitis, cholangitis, biliary or gall bladder perforation, obstructive jaundice, biliary cirrhosis, and gall bladder carcinoma may occur [39]. Clinicians should be aware of the increased risk of gallstones and their possible complications in children with DS.

Four patients were identified with hyperlipidaemia out of this 3 had hypercholesterolemia and 1 had hypertriglyceridemia. Hypercholesterolemia patients are of older age group 11yrs and hypertriglyceridemia patient at age of 1year. Generally, the mechanisms of cholesterol gallstone formation depend on the cholesterol crystals in bile, which is related to an increasing bile cholesterol saturation index and is negatively correlated to the levels of bile salts. Furthermore, the time of cholesterol crystal nucleation and dysfunction of the gallbladder also affect the formation of gallstones [40]. These results imply that high cholesterol levels and high triglyceride levels are risk factors for GSD (Gall Stone disease). This study provides a basis for identifying the population at high risk for GSD.

Gallbladder infection with Salmonella Typhi or infestation with Ascariasis both are risk factors for gall stone formation and ascariasis as a cause of acute ascending cholangitis should always be kept in mind [41]. *S.* Typhi can persist in the gall bladder of typhoid carrier patients, primarily associated with gallstones [42].

Obesity has been found to increase the risk of cholelithiasis development due to impaired gallbladder motility, excessive hepatic secretion, and bile saturation of cholesterol [43]. In the 20-year follow-up, there was an increase in the incidence of cholesterol gallstones in children from 27.3 to 70.6% and an increase in the mean BMI from 19.2 to 20.6 kg/m^2 [44]. In our study mean BMI is 26.8 ±4.67(SD).Obesity in children also may predispose to the development of gallstone complications. A higher rate of pancreatitis in the paediatric population is associated with the more frequently observed obesity and cholelithiasis in children [45]. On the other hand, rapid weight loss (>1.5 kg/week) and a low-calorie diet may also predispose to gallstone formation due to the accelerated elimination of cholesterol, which over-saturates the bile [46].

LIMITATIONS

1.Small number of Samples of a single Institution

2. No tools to assess genetic analysis and Stone analysis

3.Mainly relying on history given by the parents.

CONCLUSION

There is no doubt that prevalence of cholelithiasis in children is increasing. The incidence of gallstone disease in children is influenced by both genetic and environmental factors.

There is still lack of data on prophylaxis and treatment that would reduce the incidence of cholelithiasis in pediatric patients.

- It is important to reduce incidence of neonatal sepsis and reduce use of parenteral nutrition or reduce the duration of PN.
- It is also important to reduce the incidence of obesity and hyperlipidemia in children.
- Prevention of infectious causes of cholelithiasis.
- Thalassemia Prevention.

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