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Review Article

Cholecystogastric Fistula: Diagnostic Challenges and Evolving Therapeutic Approaches—A Systematic Review

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ABSTRACT

Background: Cholecystogastric fistula (CGF) is a rare complication occurring in chronic gallstone that presents with non-specific clinical features, diagnostic difficulties and different therapeutic options. This systematic review assessed clinical presentation, diagnosis, management and outcome of CGF.

Methods: The framework of the systematic review was designed based on the guidelines of PRISMA 2020. All of the 12 original case reports from 2013 to 2026 were included in the descriptive synthesis for 12 patients. A structured extraction framework and Joanna Briggs Institute appraisal criteria were used to assess the demographic characteristics, diagnostic investigations, therapeutic interventions, postoperative outcomes and methodological quality.

Results: The mean patient age was 65.3 ± 13.2 years (range: 40–87), and seven patients (58.3%) were female. Common abdominal symptoms were abdominal pain, nausea and vomiting, and complicated presentations included Bouveret syndrome, gastric outlet obstruction and gallbladder empyema. A preoperative diagnosis was made in seven cases (58.3%) and in five cases (41.7%) it was made intraoperatively. 83.3% of the patients had surgery (5 laparoscopy, 5 requiring an open approach, 4 conversions from laparoscopy). The nonsurgical management was offered to two patients. Overall clinical results were satisfactory, with some reporting follow-up.

Conclusion: A diagnostic evaluation and treatment for CGF should be conducted on a case-by-case basis. Minimally invasive techniques seem to be an option in certain patients; otherwise, open surgery is required in more complex patients. More extensive reports and studies are necessary to determine optimal management.

Keywords: Biliary Fistula; Cholelithiasis; Cholecystectomy; Endoscopy; Gastrointestinal; Laparoscopy; Tomography; Treatment Outcome.

INTRODUCTION

Cholelithiasis is one of the most frequent hepatobiliary diseases of the world, and it may be followed by a variety of complications such as acute cholecystitis, chronic cholecystitis, choledocholithiasis, gallstone pancreatitis and formation of biliary-enteric fistula. Cholecystoenteric fistula is a rare complication of chronic gallstone disease that occurs mainly following long-standing disease, due to the development of adhesions, pressure necrosis and erosion of the gallbladder wall into adjacent gastrointestinal structures[1,2]. Of these fistulas, cholecystoduodenal fistulas are most common, and cholecystogastric fistula (CGF), an abnormal connection between the gallbladder and the stomach, is one of the rarest. It is seen mainly in patients with chronic cholelithiasis, and can be a significant diagnostic and therapeutic challenge especially in older patients with multiple comorbidities[3].

The clinical signs and symptoms of CGF are often vague and may be non-specific leading to delayed or missed diagnosis. Patients may have recurrent upper abdominal pain and/or nausea, vomiting, dyspepsia, abdominal discomfort, or symptoms similar to uncomplicated gallbladder disease. In more complicated cases, gallstones may pass through the

fistulous communication, leading to gastric outlet obstruction, gallstone ileus or Bouveret syndrome, a rare type of mechanical obstruction due to an impacted ectopic gallstone in the proximal gastrointestinal tract[4]. Additionally, the lack of typical clinical signs and the fact that some fistulas may not show any symptoms makes early diagnosis difficult.Also, some fistulas may be latent, meaning that they can be difficult to recognize at an early stage. While ultrasonography is often the first imaging test performed for suspected gallbladder disease, computed tomography (CT) scan, magnetic resonance cholangiopancreatography and upper gastrointestinal endoscopy can yield more detailed information regarding the anatomic and physiologic characteristics of a gallbladder fistula, pneumobilia, ectopic gallstones, and associated gastrointestinal obstruction[5].

Although significant progress has been made in the field of diagnostic imaging, the diagnosis of CGF is difficult before surgery and a large number of reported cases has been diagnosed only during cholecystectomy or abdominal exploration. Surgical complexity and the potential for unintended gastrointestinal trauma can be greater due to dense inflammatory adhesions, anatomical distortion and the intimate proximity of the gallbladder to the gastric wall. Traditionally, the main treatment options were surgery (cholecystectomy and closure of the fistula if necessary)[6]. With increasing development of laparoscopic technique, surgical instrumentation and perioperative management, however, minimally invasive approach has become more and more feasible. Laparoscopic dissection of the fistula, cholecystectomy, gastric wall repair and reinforcement with omental tissue have been reported without complications and with good results in carefully selected patients. However, choice of surgical technique is still dependent on the patient's clinical condition, severity of inflammation, fistula anatomy and the surgical expertise available[7].

Management of CGF has been problematic due to its rarity and the lack of consistency in treatment guidelines for the condition with quality comparative studies. Traditionally, conservative treatment has not been advocated in the presence of symptoms, but in selected patients with significant operative risk or risk of migrated gallstones, conservative treatment or endoscopic treatment may be considered. In recent years individualized treatment planning and the possible benefits of laparoscopy have been stressed and although there is some documentation in the short and medium term, long-term recurrence has not been sufficiently documented. The presence of gallstones has also been reported as an intra-operative finding during laparoscopy in the removal of gallstones in Pakistan, where gallstone disease is a surgery-related problem of significance, and where clinical suspicion and careful operative assessment is important[6,7].

The information available is scattered and fragmentary, with much variation in the work done in diagnostic techniques, operative procedures, and reporting of outcome in individual case reports and literature reviews. Moreover, with the increasing use of minimally invasive treatment modalities, there is an increased need to review and reevaluate the current treatments and areas of continued knowledge gaps. Hence, the present systematic review was designed to critically assess the available literature on the etiology, clinical presentation, diagnosis, treatment and outcome of cholecystogastric fistula with special reference to the changing landscape of minimally invasive surgical management of cholecystic fistula and its implications in clinical practice in Pakistan and other resource-challenged healthcare settings.

MATERIALS AND METHODS

Study design and reporting guidelines

We conducted this systematic review to assess the clinical evidence available for the etiology, clinical features, diagnostic workup, management and outcomes of cholecystogastric fistula (CGF). The review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines to ensure transparent and reproducible reporting[8]. Individual clinical reports of confirmed cases of CGF were included in the review due to the lack of any published clinical studies of CGF other than case reports. Special focus was given to the diagnostic difficulties, recognition pre- and postoperatively, laparoscopic and open surgical procedures, endoscopy and

endoscopy procedures, and postoperative results. Data from various geographical regions was analysed to detect any changing management practices and their implications in the clinical scenario, including in Pakistan.

Literature search strategy

A systematic literature search was established to find relevant publications from inception of the databases up to October 21, 2026. The search strategy involved PubMed/MEDLINE, Scopus, Web of Science, Embase, and Google Scholar databases with supplementary search of PakMediNet to find publications from Pakistan and neighbouring areas. The words used in search were: "cholecystogastric fistula," "cholecysto-gastric fistula," "gallbladder-gastric fistula", "cholecystoenteric fistula," "biliary-enteric fistula", "Bouveret syndrome," "gastric outlet obstruction", "gallstone ileus", "laparoscopic cholecystectomy", and "surgical management. Search terms were linked using Boolean operators (AND/OR) and database-specific search syntax was developed to ensure retrieval of more/less sensitive items. A secondary search of the reference lists of relevant case reports, observational investigations, and published reviews was conducted to complement the initial search, to find further potentially eligible studies. The search strategy was designed based on PRISMA-S recommendations[9].

Eligibility criteria

Studies were considered eligible if they were original human case reports, case series, or observational investigations reporting on radiologically, endoscopically, or surgically confirmed CGF. Studies were included if they included adequate data at the patient level on demographic characteristics, presenting symptoms, underlying etiology, diagnostic investigations, treatments modalities or clinical outcomes. If cholecystoenteric fistulas (CEF) were not distinguishable as a separate entity in the publications or if the data for this specific type of fistula could not be separated from the other data, the records could not be used. There were no age, gender, geographical or healthcare provider treatment restrictions. The articles in English were accepted and non-English articles were accepted if reliable translations were available. Primary synthesis was restricted to narrative reviews, systematic reviews with no new original patient data, editorials, conference abstracts that did not provide detailed clinical information, animal studies, duplicate publications, reports involving only non-gastric biliary fistulas. Only newly reported patients were collected to prevent duplication of reports, and only those reports with case reports could be included following review of the literature.

Study selection and screening

A predefined screening framework was used to assess potentially relevant publications against the eligibility criteria. The process comprised identification of records, removal of duplicate references, title and abstract screening, full-text eligibility assessment, and documentation of reasons for exclusion. Potentially overlapping publications were assessed by comparing study authors, institutional affiliations, clinical characteristics, and reported treatment details. Twelve original case reports published between 2013 and 2026 were available for the final descriptive evidence synthesis, each reporting one patient with CGF. These publications were examined for completeness of diagnostic, therapeutic, and outcome information. The study-selection process was organized according to the PRISMA 2020 framework[8], with the final included publications summarized in the Results section. Database-level retrieval and exclusion counts were not reconstructed because the underlying search logs were unavailable.

Twelve full-text clinical publications concerning cholecystogastric fistula, published between 2013 and 2026, were assembled for eligibility assessment. All publications reported original human cases of cholecystogastric fistula and provided extractable information on clinical presentation, diagnostic investigations, therapeutic management, or patient outcomes. Publications containing accompanying narrative or literature reviews were assessed using their newly reported original cases only, thereby avoiding duplication of previously published patient information. The study-selection summary was organized according to the PRISMA 2020 reporting framework[8]. Database-level identification, deduplication, and screening counts were not available in

the supplied records and were therefore not reconstructed retrospectively.

PRISMA stage	Description	Number
Identification	Records identified through database searches	Not documented
Identification	Records identified through citation searching and other sources	Not documented
Before screening	Duplicate records removed	Not documented
Screening	Records screened by title and abstract	Not documented
Screening	Records excluded	Not documented
Eligibility	Full-text reports supplied for assessment	12
Eligibility	Supplied full-text reports successfully retrieved	12
Eligibility	Supplied reports excluded from this evidence set	0
Included	Original clinical publications retained	12
Included	Individual CGF patients represented	12

Table 1: Summary of studies selection

CGF, cholecystogastric fistula; PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses. The counts describe the supplied full-text collection and do not substitute for a completed database-search audit.

Data extraction and outcome measures

Patient-level data from eligible publications were organized in a standardized framework of data-extraction. Screened variables were: the first author, year of publication, country of study, study design, patient age, sex, presenting symptoms, underlying biliary disease, accompanying comorbidities, diagnostic modalities used, time of diagnosis of CGF, treatment strategy, surgical findings, postoperative complications, hospital stay, and follow-up results. Diagnostic investigations were classified as ultrasonography, computed tomography, magnetic resonance imaging, magnetic resonance cholangiopancreatography, upper gastrointestinal endoscopy, intraoperative assessment and endoscopic retrograde cholangiopancreatography. The main results sought were the diagnosis time and the pattern of diagnosis of the CGF and definitive treatment strategy. Secondary outcomes were conversion to laparotomy, technique of fistula closure, fistula complications, hospital stay, clinical recovery, recurrence of symptoms, and follow-up period. Data not specifically reported in the original publication was not assumed to be missing, but rather reported as not reported.

Methodological quality assessment

Eligible case reports were subjected to a critical appraisal using the Joanna Briggs Institute (JBI) critical appraisal checklist for case reports[10]. Eight domains of assessment included demographic characteristics, clinical history and timeline, presenting clinical picture, diagnostic evaluations, therapeutic interventions, outcome after intervention, adverse events, and clinical lessons. The domains were measured by the categories: yes, no, unclear, or not applicable. The results were presented in a matrix to make it easy to see the strengths and areas for improvement in the reporting in the publications included. The appraisal was done qualitatively, as the JBI checklist does not offer a validated numeric risk-of-bias score or a specific percentage risk-of-bias classification. Certain aspects of incomplete follow-up information, inconsistent reporting of complications and limitations of evidence obtained from individual case reports were specifically addressed.

Data synthesis and statistical analysis

Given the variability in patient characteristics, clinical presentation, diagnostic investigations, therapeutic interventions, and follow up reporting in the publications available, a descriptive and narrative synthesis was performed. Descriptive statistics were used to summarise categorical data in frequencies and percentages and continuous data in means and standard deviations (SD) or ranges, depending on the availability of these data. Evidence was synthesized in the following five domains: study characteristics, demographic and clinical manifestations, diagnostic modalities, treatment strategies, and postoperative outcomes. Preoperative and intraoperative diagnosis were analyzed separately and surgical modalities were divided into completed laparoscopic surgery, open surgery, conversion from laparoscopy to

open surgery and nonsurgical management. Special focus was laid on complex presentations such as Bouveret, gastric outlet obstruction, gallbladder empyema and iatrogenic fistula. Narrative comparisons were made with other published clinical studies, such as case series and reports, on broader cholecysto-enteric fistulas, to place the similarities and differences in the diagnostic and treatment approaches used into perspective. These external comparative studies were not included in the denominators of the main patient-level syntheses unless they met the inclusion criteria on their own. The synthesis was based on the principles of the Synthesis Without Meta-analysis (SWiM) reporting guideline[11]. Due to heterogeneous clinical characteristics and the absence of similar effect estimates, formal meta-analysis was not performed as most of the articles were uncontrolled case reports.

Ethical considerations

As this review did not involve the recruitment of patients, interventions or access to identifiable patient information, it was not considered to be an intervention and was exempt from ethical approval and individual informed consent. The methods used to synthesize the evidence used were appropriate and the findings presented followed accepted scientific standards in conditions of scientific transparency and responsible evidence synthesis.

RESULTS

The mean patient age was 65.3 ± 13.2 years (range: 40–87), and seven patients (58.3%) were female. The most common symptom was abdominal pain, often with vomiting or nausea. Complicated presentations were Bouveret syndrome, gastric outlet obstruction, gallbladder empyema and an iatrogenic fistula from previous percutaneous cholecystostomy (Table 2).

Study	Age (years)	Sex	Principal clinical presentation
Boland (2013) [12]	68	Female	Epigastric pain, nausea, vomiting
Aamery (2019) [13]	58	Female	Indigestion, belching, abdominal pain, vomiting
Nayak (2021) [14]	85	Female	Right upper abdominal pain and fever
Rey Chaves (2022) [15]	87	Male	Abdominal pain, vomiting, Bouveret syndrome
Alabd (2022) [16]	77	Male	Nausea, bilious vomiting; previous cholecystostomy
Aljohani (2024) [17]	63	Female	Postprandial right upper abdominal pain, nausea, vomiting
Ben Hassine (2024) [18]	59	Male	Acute abdominal pain, fever, gallbladder empyema
Yang and Zhong (2025) [19]	60	Male	Vomiting, upper abdominal pain, pyloric obstruction
Sapell (2025) [20]	63	Female	Abdominal pain, nausea, gastric outlet obstruction
Ali (2025) [21]	40	Female	Chronic epigastric pain, nausea, vomiting
Valencia Valverde (2026) [22]	69	Female	Recurrent right upper quadrant pain
Chen and Luo (2026) [23]	54	Male	Intermittent right upper quadrant pain

Table 2: Patient characteristics and clinical history of 12 reported cases.

Age is expressed in years; overall age is mean ± standard deviation. Sex and clinical characteristics were extracted from the individual case descriptions.

CGF was recognized preoperatively in seven cases (58.3%) and intraoperatively in five (41.7%). CT, MRCP/MRI, and upper gastrointestinal endoscopy provided complementary information about fistulous anatomy and migrated gallstones. Unexpected intraoperative diagnosis remained important, particularly where preoperative investigations demonstrated cholelithiasis without identifying the fistula (Table 3).

Study	Relevant investigations	Principal diagnostic finding	CGF diagnosis
Boland (2013)	CT, ultrasound, upper GI endoscopy	Gallbladder–gastric communication and ectopic gallstone	Preoperative
Aamery (2019)	Ultrasound, upper GI endoscopy	Fistula discovered during cholecystectomy	Intraoperative
Nayak (2021)	CT, MRCP, OGD, ERCP	MRCP demonstrated suspected fistulous communication	Preoperative
Rey Chaves (2022)	MRI, endoscopy, ERCP	Abnormal tract with migrated gastric gallstone	Preoperative
Alabd (2022)	CT, EGD	Gas-filled fistulous tract and antral opening	Preoperative
Aljohani (2024)	Ultrasound, laparoscopy	Prepyloric fistula discovered during surgery	Intraoperative
Ben Hassine (2024)	Ultrasound, operative exploration	CGF with abscess and gangrenous cholecystitis	Intraoperative
Yang and Zhong (2025)	X-ray, CT, endoscopy	Pneumobilia, ectopic stone and pyloric obstruction	Preoperative
Sapell (2025)	CT, contrast study, endoscopy	Gastric outlet obstruction and fistulous communication	Preoperative
Ali (2025)	Ultrasound, operative exploration	Gallbladder–gastric fistula concealed by adhesions	Intraoperative
Valencia Valverde (2026)	Ultrasound, laparoscopy	CGF discovered during elective cholecystectomy	Intraoperative
Chen and Luo (2026)	CT, gastroscopy	Pneumobilia, gastric antral fistula and bile drainage	Preoperative

Table 3: Diagnostic approaches used in the 12 cases

CGF, cholecystogastric fistula; CT, computed tomography; MRCP, magnetic resonance cholangiopancreatography; OGD/EGD, upper gastrointestinal endoscopy; ERCP, endoscopic retrograde cholangiopancreatography; MRI, magnetic resonance imaging. Preoperative refers to identification before the definitive operation; intraoperative refers to identification during surgical exploration.

Ten patients (83.3%) underwent surgery, while one received conservative management and one underwent a nonsurgical, minimally invasive intervention (Table 4). Of the ten surgical cases, five were completed laparoscopically and five required an open approach, including four conversions from attempted laparoscopy. Fistula repair techniques included primary suturing, omental patch reinforcement, and endoscopic stapling.

Study	Definitive management	Fistula intervention
Boland (2013)	Open gastrotomy and stone extraction	Fistula left unrepaired
Aamery (2019)	Laparoscopy converted to open cholecystectomy	Division, two-layer closure and omental patch
Nayak (2021)	Laparoscopic cholecystectomy	Omental patch repair of incomplete fistula
Rey Chaves (2022)	Laparoscopic gastrotomy and stone extraction	Definitive fistula surgery deferred
Alabd (2022)	Conservative management	No operative repair
Aljohani (2024)	Laparoscopic cholecystectomy	Fistula excision, primary closure and omental patch
Ben Hassine (2024)	Laparoscopy converted to open surgery	Cholecystectomy, abscess drainage and single-layer closure
Yang and Zhong (2025)	Endoscopic extraction followed by converted open surgery	Fistula repair and cholecystectomy
Sapell (2025)	Percutaneous endoscopic lithotripsy and feeding-tube intervention	No definitive fistula repair reported
Ali (2025)	Laparoscopy converted to open cholecystectomy	Two-layer closure and omental patch
Valencia Valverde (2026)	Laparoscopic cholecystectomy	Endostapler division and gastric closure
Chen and Luo (2026)	Laparoscopic cholecystectomy and bile duct exploration	Fistula excision and primary gastric closure

Table 4: Therapeutic management of 12 cholecystogastric fistula cases

Treatments were classified according to the definitive management reported for each patient. Endoscopic interventions undertaken before surgery were retained within the descriptions but not counted as separate patients.

Clinical improvement or favorable recovery was reported across the 12 cases, although management intensity and follow-up duration varied. Reported postoperative hospital stays ranged from approximately one to 17 days (Table 5). Several patients remained asymptomatic during short-term follow-up; however, inconsistent reporting of long-term outcomes limited assessment of recurrence and delayed complications.

Study	Hospital stay after intervention	Clinical outcome	Follow-up reported
Boland (2013)	Discharged during following week	Uncomplicated postoperative recovery	Outpatient review; doing well
Aamery (2019)	3 days	Uneventful recovery	10 weeks; no complications
Nayak (2021)	4 days	Uneventful recovery	5 months; doing well
Rey Chaves (2022)	2 days	No reported procedural complications	30, 60 and 90 days
Alabd (2022)	NR	Symptoms improved with supportive care	NR
Aljohani (2024)	NR	Uneventful recovery; negative leak test	1 week; asymptomatic
Ben Hassine (2024)	5 days	Uneventful postoperative recovery	6 months; asymptomatic
Yang and Zhong (2025)	9 days	Favorable postoperative recovery	Outpatient follow-up; no further concerns
Sapell (2025)	NR	Obstruction relieved; stone passage documented following staged intervention	Subsequent imaging and clinical evaluation
Ali (2025)	3 days	Uneventful postoperative recovery	10 weeks; no recurrence
Valencia Valverde (2026)	24 hours	Uneventful recovery	Follow-up; asymptomatic
Chen and Luo (2026)	17 days after surgery	Recovery following transient postoperative fever	Long-term follow-up unavailable

Table 5: Clinical outcomes reported in the 12 publications

NR, not reported or not separately established. Hospital stay refers to postoperative hospitalization where reported; the duration was not imputed where precise data were unavailable.

The preliminary appraisal demonstrated generally comprehensive reporting of patient demographics, clinical presentation, diagnostic assessments, interventions, and post-intervention findings. Areas requiring particular scrutiny included the completeness of clinical timelines and documentation of adverse events. These limitations were relevant when interpreting the predominantly case-based evidence.

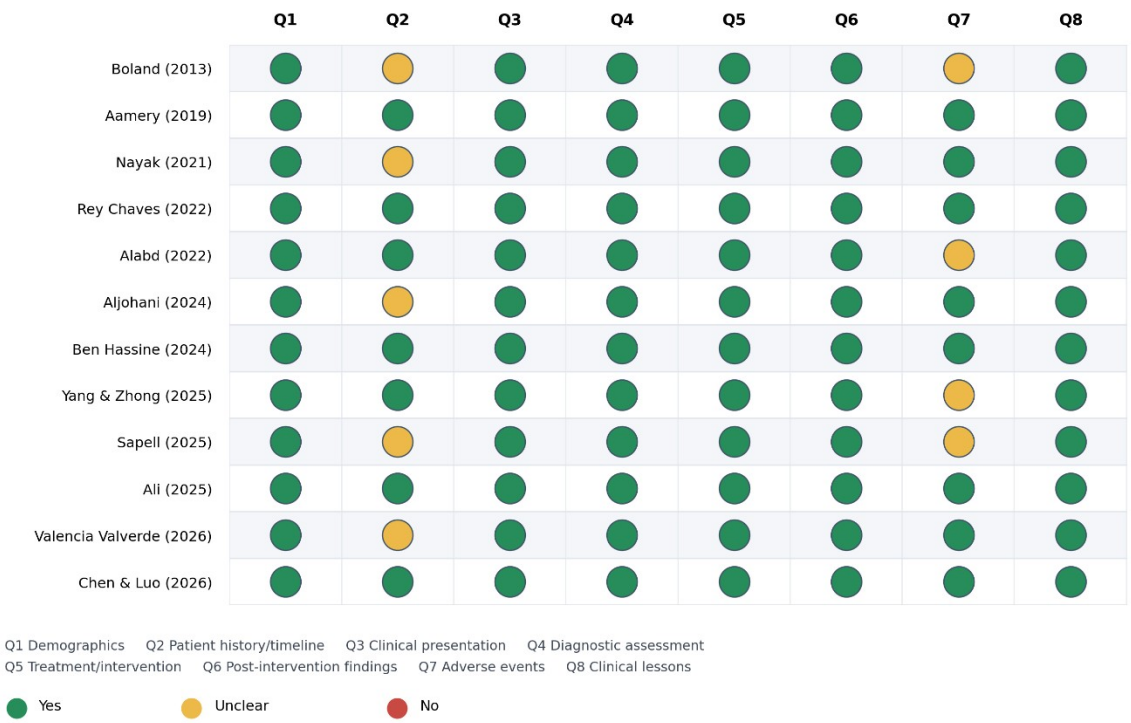


Figure 1: Eight-item critical appraisal checklist was used to perform preliminary methodological reporting quality appraisal of 12 cholecystogastric fistulae case reports. Yes (Green circle): the criteria is reported adequately; Yes (Yellow circle): the criteria is reported but there is some uncertainty; No (Red circle): the criteria is not reported. Q1–8 are questions on patient demography, clinical history/timeline, presenting condition, diagnostic assessment, therapeutic intervention, post-intervention condition, adverse events and clinical lessons, respectively.

DISCUSSION

In the present systematic review, a total of 12 published case reports were selected that included 12 patients with cholecystogastric fistula (CGF) between 2013 and 2026. The results showed high clinical diversity, diagnostic methods, and therapeutic modalities, which is in line with the limited incidence and the complexity of this disease. Mean age of patients was 65.3 ± 13.2 years (range 40-87 years), with 58.3 % of patients female. These findings were similar to those of Li et al.[24] who studied 29 patients with cholecystoenteric fistulas, who had a mean age of 68.7 years and predomination by females. Likewise, Beksac et al.[25] reported a dual cholecystogastric and cholecystoduodenal fistula, highlighting the relationship between a longstanding gallstone disease, frequent inflammation and the development of fistulas. The current results indicated that advanced age and chronic biliary path was common in CGF patients, but not restricted to those younger patients.

Abdominal pain was the most common clinical symptom that has been reported in the present review, in combination with nausea, vomiting, dyspepsia and fever. Complicated presentations were gastric outlet obstruction, Bouveret syndrome, gallbladder empyema and iatrogenic fistula formation. The observations were similar to that of Ali et al.[26] who described an unusual case of an intrahepatic gallbladder associated with CGF, which is a remarkable example of the heterogenous anatomical and clinical presentation of this condition. Furthermore, Ayala-Hernández et al.[27] reported a 59-year-old female with a long history of biliary colic, pneumobilia, gastric distention and impacted pyloric gallstone. They found that these observations were confirmed by their findings of a possible slow progression of CGF prior to the onset of obstructive gastrointestinal symptoms. Together, these studies highlighted the need to be mindful of the possibility of a biliary-enteric fistula in patients with chronic gallstone disease, especially if upper abdominal symptoms persist despite conventional therapy.

Preoperative diagnosis was made in 7 cases (58.3%) and made in surgery in 5 cases (41.7%). This discovery underscored the ongoing difficulties with diagnosis

despite ongoing improvements in imaging and endoscopy techniques for CGF. Li et al. [24] reported that only 9 of 29 patients with cholecystoenteric fistulas were diagnosed preoperatively, suggesting that there are significant challenges in the diagnosis of fistulous communication before surgery. Besides, the role of cross-sectional imaging in the evaluation of suspected cases was demonstrated by Chou, who showed abnormal communication between the gall bladder and stomach in computed tomography images as a diagnostic aid for CGF[28]. In the same way, the successful identification of a treatment opening of the gastric fistula by endoscopy was reported by Bodh et al.[29] in a patient sought for possible gastric malignancy. This study confirmed the value of using a multimodality approach to assessment in the presence of clinical and/or radiological evidence of complicated gallbladder disease. However, given the moderate, but not low, percentage of patients that were recognized preoperatively in this review, one has to be careful in interpreting the findings as there were only a few cases reported in a highly selected manner.

Management options listed in this review showed a gradual shift towards less invasive surgical methods and traditional open surgery. Ten (83%) of the 12 patients received surgical intervention - five laparoscopically and five open, four of whom were open conversions from attempted laparoscopy. The results were consistent with Li et al.[24] who attempted laparoscopy in all 29 patients with cholecystoenteric fistula, and converted them to laparotomy in 5 patients (17.2%). The authors believe that the conversion is mainly due to severe adhesion, bleeding and lack of anatomical structure identification. Importantly, their study did not only include fistula types, excluding CGF, thus limiting direct comparisons. The increased percentage of open procedures in this review was due to technically difficult anatomy and complicated presentations as described in selected case reports and should not be considered a reliable estimate of the percentage of open procedures in routine practice.

Individualized management also proved to be a significant factor, especially in elderly patients, in individuals with substantial comorbidities, and in those patients with gastric outlet obstruction. The various methods used for stone removal in the present review included endoscopic stone extraction, lithotripsy, conservative treatment and staged surgical procedures depending on the clinical condition and anatomic findings. Management of CGF-associated obstruction by stone removal followed by interval cholecystectomy has also been reported[27] and is feasible in some cases. Beksac et al.[25] reported two cases of incomplete biliary fistulas which exemplify how the anatomy of a fistula may affect the operative approach and degree of repair. These observations suggested not all patients may need or be appropriate for complete fistula excision and simultaneous cholecystectomy. Rather, decisions regarding treatment should include the presence of obstruction, inflammation, tissue viability, comorbidities and risks of prolonged surgical procedure.

The results of interventions in the reviewed cases were generally favourable: some patients had an uneventful course after the intervention and symptom resolution was seen in a number of cases. The reported postoperative hospitalization ranged from about 1 to 17 days, depending upon the complexity of the surgery, as well as any associated complications and the patients' characteristics. Li et al.[24] reported a mean hospital stay of 4 days with hospitalization ranging from 3 to 6 days for patients who were successfully laparoscopically managed. Their results confirmed the possible advantages of minimally invasive surgery in the case of patients selected appropriately. The present review however failed to determine whether the laparoscopic management led to better results, since there were no controlled comparisons and the severity of the cases varied greatly. In addition, lack of documentation of complications, recurrence and long term follow up limited the assessment of treatment durability. These restrictions emphasized the need for uniform reporting of outcomes following surgery in future publications of the CGF.

These findings had significant clinical implications in the context of surgical practice in Pakistan and other contexts with limited resources. The included Pakistani case by Ali et al.[21] showed that CGF was found during the procedure of laparoscopic cholecystectomy in unexpected places, and the procedure was later converted to open surgery due to dense adhesions. Similarly,

Bodh et al.[29] in India reported the endoscopy facilitating diagnosis due to initial imaging suspicions of gastric malignancy. These regional observations highlighted the need to keep a high index of suspicion in patients with recurrent biliary symptoms, advanced imaging modalities in patients when clinically indicated and preparedness for complex intra-operative findings. Enabling access to multidisciplinary expertise such as gastrointestinal endoscopy, hepatobiliary surgery, advanced laparoscopy may help in clinical decision making. However, due to the paucity of Pakistan-specific data, conclusions could not be drawn on the incidence of the disease at the national level or the diagnostic performance of the tests, nor could any comparisons be made between treatment outcomes.

Strengths and limitations

A major advantage of the present review was the systematic aggregation of 12 original clinical cases, reported in the literature during the past 13 years, covering various geographical areas and diagnostic and treatment strategies. The review highlighted the recognition of CGF preoperatively, surgical treatment, minimally invasive options and postoperative outcomes, and gave a clinically relevant overview of the changing management of CGF. A Pakistani publication was also included which provided regional context. However, there are some drawbacks that should be noted. All of the studies included were individual case reports, thus a small, heterogeneous group of patients with no comparison groups. Selection and publication biases could have led to the selection of unusual presentations and successful treatment that may not have been representative. Moreover, clinical severity, diagnostic criteria, and follow-up periods varied and direct comparisons were not possible, nor could there be a formal meta-analysis. During the JBI assessment, potential areas of concern were noted related to the completeness of clinical reporting, such as adverse events and longer-term outcomes. Importantly, the review was not based on all publications in the database, and there were not full screening records given for the database to verify the comprehensiveness of study identification. It should be noted that the findings are descriptive evidence, not estimates of treatment effectiveness so should be interpreted accordingly.

CONCLUSION

Despite the advances in the diagnosis and management of chronic gallstone disease, cholecystogastric fistula continued to be a rare and complex event to diagnose and manage, often occurring as a non-specific gastrointestinal complaint or as an incidental finding in surgery. Preoperative diagnosis was successful in more than half of the reviewed cases, while intraoperative diagnosis was important, highlighting the importance of appropriate imaging, endoscopic evaluation and careful surgical planning. Conservative, endoscopy, laparoscopic and open surgical procedures were used with good short-term results. However, in some patients, conversion to open surgery was required because of extensive adhesions, distortions and other complications, but minimally invasive surgery seemed possible in some cases.

Further multicenter studies, prospective registries and standardized reporting of operative technique, diagnostic and postoperative complications, and long-term results are required to determine evidence-based guidelines for the treatment of cholecystogastric fistula in under-represented regions like Pakistan.

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