cholecystectomy, provides a limited view of the biliary tract anatomy and can result in a higher rate of biliary leaking [6]. Iatrogenic bile duct injury is on higher side in laparoscopic cholecystectomy than in open variety and may be because of the long learning curve of laparoscopic procedure [7].

Bile duct injuries take place in about 0.1%-0.2% in open cholecystectomy and 0.3%-0.8% at laparoscopic one [8]. The biliary leak is commonly the end result of direct injuries to the bile duct, unsecure or slipped ligature or clip of the stump of cystic duct, or bile leak from the liver bed and commonly induced with blockage of the distal part of the duct from residual stone or stricture [9]. A minor biliary leak can disappear spontaneously whilst a major leak can result in drastic effect on patient [10]. Patients with internal or external bile leak usually present with localized or generalized biliary peritonitis [11]. About 10% - 24% of bile duct injuries are identified during surgery whilst the remaining injuries are recognized after surgery or after discharge [12]. Early diagnosis and treatment is the cornerstone for pleasant outcome [13]. Unrecognized or late diagnosis of bile duct injury can lead to serious consequences such as hepatic failure or death [7,14].

PATIENTS AND METHODS

A prospective study was conducted among 968 patients in Al–Kadhimain medical city from January 2019 to February 2020. The data were obtained from the patients getting admitted with biliary leakage after cholecystectomy or developed biliary leakage after cholecystectomy at the surgical department in our hospital. The patients who developed biliary leakage following cholecystectomy were assessed by thorough history, clinical examination and postoperative investigations including abdominal ultrasound, CT abdomen and MRCP to delineate bile duct anatomy and determine the site of bile leakage and the modalities of management that can be used. The outcomes of these modalities of management were noted and assessed.

RESULTS

A total of 968 cholecystectomies were carried out in this study, out of which 311 were open cholecystectomies and the rest 657 were laparoscopic cholecystectomies. 23 laparoscopic cholecystectomies were converted to open cholecystectomies which are included in open cholecystectomy category.

In this study, 17 patients developed biliary leakage following cholecyectomy. The overall incidence of biliary leak following cholecystectomy was 1.75%. Among those 17 patients with biliary leakage, 29.41% (5) were done by open cholecystectomies and 70.58% (12) were done laparoscopically (Table 1).

Table 1 erall incidence of bile lea following cholecystectomy.

Type of cholecystectomy	Number of cases	Percentage %
Open cholecystectomy	5	0.51
Laparoscopic cholecystectomy	12	1.23
Total	17	1.75

Among those 17 patients who developed biliary leakage following cholecystectomies, 6 patients were diagnosed as major bile duct injury (5 following laparoscopic approach and 1 following open approach). The incidence of major bile duct injury was 0.61% (Table 2).

Table 2: Incidence of major bile leak following cholecystectomy.

Type of cholecystectomy	Number of cases with major bile duct injury	Percentage %
Open cholecystectomy	1	0.1
Laparoscopic cholecystectomy	5	0.51
Total	6	0.61

Among those 17 patients who developed biliary leakage following cholecystectomies, 11 patients were diagnosed as bile leak from gallbladder bed, duct of Luschka or minor bile duct injury (7 following laparoscopic approach and 4 following open approach). The incidence of leakage from gallbladder bed, duct of Luschka or minor bile duct injury was 1.13% (Table 3).

Table 3: The incidence of leakage from gallbladder bed, duct of Luschka or minor bile duct injury following cholecystectomy.

Type of cholecystectomy	Number of cases with leakage from gallbladder bed, duct of Luschka or minor bile duct injury	Percentage %

Open cholecystectomy	4	0.41
Laparoscopic cholecystectomy	7	0.72
Total	11	1.13

The patients with bile leakage following cholecystectomy were evaluated for the site of bile duct injury by abdominal ultrasound, CT abdomen and MRCP. The site of bile duct injury was determined to be common hepatic duct in 2 patients (11.76%), common bile duct in 3 patients (17.64%) and cystic duct in 1 patient (5.88%). Bile leak from gallbladder bed, duct of Luschka or minor bile duct injury was found in 11 patients (64.7%) (Table 4).

Table 4: The site of bile leakage following cholecystectomy.

Site	Number of cases	Percentage %
gallbladder bed, duct of Luschka or minor accessory duct	11	64.7
Cystic duct	1	5.88
Common bile duct	3	17.64
Common hepatic duct	2	11.76
Total	17	100%

Out of 17 patients with biliary leakage after cholecystectomy and depending upon the general condition of those patients, conservative treatment in the form of controlled external biliary fistula was considered 13 patients (76.47%) with biliary leakage after cholecystectomy. Out of which 70.58% (12 patients) of bile leak resolve spontaneously with conservative treatment and controlled external fistula. Interventions in the form of primary suturing of bile duct (17.64%) and hepaticojejunostomy (11.76%) were done in 5 patients (Table 5).

Table 5: Modalities of treatment of biliary leakage following cholecystectomy.

Management	Number of cases	Percentage %
Conservative with controlled external fistula	12	70.58
Operative		
Primary suturing of bile duct	3	17.64
Hepaticojejunostomy	2	11.76
Total	17	100%

Out of 17 cases with bile leak following cholecystectomy, 15 patients (88.23%) recovered without complication. Other 2 patients (11.76%) died due to delayed presentation (Table 6).

Table 6: The results of surgical management for bile leakage after cholecystectomy.

Results of surgical management	Number of cases	Percentage %
Uneventful recovery	15	88.23
Mortality	2	11.76
Total	17	100%

DISCUSION

Cholecystectomy is the most commonly performed abdominal operations all over the world and biliary leakage following bile duct injury after cholecystectomy is a potentially devastating complication. The ill effect of bile duct injury can range from minor clinically insignificant bile leaks, bilomas, and bile ascities to biliary peritonitis, sepsis and even death in the acute setting and bile duct strictures, secondary biliary cirrhosis, portal hypertension and end stage liver disease necessitating liver transplantation in long term. Adequate and timely management can usually salvage the situation and save the patient from major morbidity and mortality [14].

Laparoscopic cholecystectomy has replaced the open procedure in all but complicated cases. It is said to be

associated with minimal morbidity, shorter hospital stay, earlier return to the work and better cosmetic results [4]. However, it is associated with higher incidence of biliary injury than the open approach, ranges from 0.5% to 2% [15].

In this study, we found that laparoscopic approach resulted in higher incidence of major bile duct injury (0.51%) than in the open approach (0.1%). Similar results were obtained by other studies. Adamsen et al found that the incidence of bile duct injuries is more common following laparoscopic cholecystectomies which were reported in 1.3% of cases [16]. Ali et al. [17] and Karvonen et al [9] also found higher incidence of bile duct injuries following laparoscopic approach (0.2%-0.7%) than in open approach (0.1%-0.4%).

In this study, the incidence of major bile duct injury was 0.61% and the overall incidence of biliary leak following cholecystectomy was 1.75%. Our results are comparable to the results obtained by Strasberg et al [18] who found that the incidence of major bile duct injuries was around 0.5%. Similar result was obtained by a Waage in Sweden [19] who found that the rate of bile duct injury was 0.4%.

In this study, the most common site of leakage was from gallbladder bed, duct of luschka and minor accessory bile duct. Similar result was obtained by Strasberg et al. [18]. In this study, 70.58% of patients with bile leak resolve spontaneously with conservative treatment and controlled external fistula. Similar result was obtained by Chen et al [20] who found that 82.5% of patients with bile leak recovered after conservative management. Conservative treatment in the form of external drainage of bile has shown excellent result in the management of bile leak supposing that biliary – enteric continuity is present and there is no obstruction to bile flow distal to the origin of fistula. However, in case of major bile duct injury, operative management should be considered [18,21]. Only 29.41% of cases (5 patients) required interventions in the form of primary suturing of bile duct (17.64%) and hepaticojejunostomy (11.76%). Other 11.76% (2 patients) died because of complications following biliary leak due to delayed presentation.

CONCLUSION

The overall incidence of biliary leak following cholecystectomy was 1.75% and the incidence of major bile duct injury was 0.61%. Most cases (70.58%) managed conservatively and recovered without residual effect on expectant treatment. Most major bile duct injuries (29.41%) required intervention and repair. Mortality rate was 11.76% due to late presentation with impossible exploration as they could not be optimized for a major surgical intervention.

Major bile duct injury following cholecystectomy can be devastating to the patient and needs prompt diagnosis and timely surgical intervention but leakage from gallbladder bed, duct of Luschka or accessory bile duct needs only conservative treatment and mostly leads to disappearance of leak without any residual effect.

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