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A retrospective analysis of postoperative complications after laparoscopic and open cholecystectomy in a Palestinian government hospital: associations between sociodemographic and surgical variables

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ABSTRACT

Gallbladder disease is one of the most prevalent digestive disorders affecting the health and quality of life of millions of people around the world. Laparoscopic cholecystectomy is the procedure of choice in managing symptomatic cholelithiasis. This study was conducted to report on the postoperative complications after laparoscopic and open cholecystectomy in a Palestinian government hospital. The study also investigated associations between sociodemographic and surgical variables of the study patients and postoperative complications, duration of hospital stay, and duration of the surgical procedure. A retrospective observational design was used in the present study in which patient files (*n = 101*) were included in the final analysis. The study site was one of the main hospitals in Hebron District, Palestine. Of the patients included, the majority (75.2%) were female in gender, more than half (53.5%) were between 40 and 60 years of age, the majority (88.1%) had laparoscopic cholecystectomy, the duration of the surgical procedure ranged from 40 minutes to 3 hours, and the duration of hospital stay ranged from 1 to 14 days. Postoperative complications were reported in 14 patients (13.9% of the cases). Postoperative complications were significantly associated with open cholecystectomy (χ^2/Fisher's exact test = 8.73, p value = 0.011, Spearman's rho = 0.30, p value = 0.003). Patients who have had postoperative complications stayed significantly longer duration in the hospital (χ^2/Fisher's exact test = 61.86, p value < 0.001; Spearman's rho = 0.79, p value < 0.001). Older patients have had significantly more open cholecystectomy compared to younger patients (χ^2/Fisher's exact test = 12.50, p value = 0.003; Spearman's rho = 0.34, p value = 0.001) and the length of the surgical procedure was significantly higher (χ^2/Fisher's exact test = 7.30, p value = 0.043; Spearman's rho = 0.21, p value = 0.036). Laparoscopic cholecystectomies are the standard of practice in managing gallstone disease in Palestine. Laparoscopic cholecystectomies were associated with reduced postoperative complications, surgical operation time, and hospital stay similar to those reported previously. More studies are still needed to analyze and compare pain and speed of recovery after laparoscopic cholecystectomies in Palestine.

Keywords: Gallbladder Disease, Hospital Stay, Laparoscopic Cholecystectomy, Open Cholecystectomy, Postoperative Complications.

INTRODUCTION

Gallbladder disease is one of the most prevalent digestive disorders affecting the health and quality of life of millions of people around the world [1]. According to recent estimates, 10% to 15% of the adult population in the US are affected by gallstones [2]. Gallstones are the reason for numerous visits to physicians each year. In 2009 alone, gallstones were the reason for 300,000 visits to physicians in the US [3]. Additionally, gallstones were also the second most prevalent gastrointestinal hospital discharge diagnosis. Gallstones also result in the death of about 3,000 people in the US each year [4].

Being of older age, female in gender, and obese are the traditional major risk factors for cholesterol gallstone disease [2]. Despite the fact that gallbladder disease is one of the most common digestive disorders, many aspects of the etiology and pathophysiology of this disease remain elusive [5]. In the majority of cases, cholecystectomy is the procedure of choice in managing symptomatic cholelithiasis. It has been estimated that more than 20 million people in the US are affected by cholelithiasis and more than 500,000 cholecystectomies are performed yearly [1]. Alternative therapeutic options include percutaneous drainage, dissolution

therapy, and lithotripsy. Compared to cholecystectomies, these alternative methods have proven ineffective in the majority of the patients and were associated with very high incidence of recurrence (up to 61% of the cases) [1].

The first cholecystectomy was reportedly performed by the German surgeon Carl Langebuch in 1882 [6]. Interestingly, the first laparoscopic cholecystectomy was also reportedly performed by the German surgeon Erich Mühe in 1985 [6]. Although both procedures are still used, globally, laparoscopic cholecystectomy has evolved to become the standard of practice for surgical management of symptomatic cholelithiasis. However, open cholecystectomy can be used when laparoscopic cholecystectomy is contraindicated. Worldwide, cholecystectomies have brought numerous benefits to people affected by gallbladder disease. Today, cholecystectomies, especially laparoscopic are increasingly accepted by patients in the management of gallstone disease. This increasing acceptance was brought by more than a century of research in the domain which resulted in more precise diagnosis, safety and ease of the surgical procedure, patient satisfaction with the long-term relief of symptoms, and management of the pathological processes involved [7].

Over the past period, reports on the surgical alternatives in the management of gallstones have documented the progress in terms of safety and reduced risks of postoperative morbidity and mortality [1]. In different countries, studies have reported advantages of using laparoscopic cholecystectomy. These advantages include decreased hospital stay, reduced recovery interval, and a decrease in postoperative complications compared to open cholecystectomy [1]. However, little research was conducted in the outcomes and postoperative complications of cholecystectomies in Palestinian hospitals. A rapid screening of the literature showed that the majority of studies conducted in Palestine with regard to cholecystectomy focused on the use of antibiotics postoperatively [8, 9]. A recent study reported on the outcomes of open appendectomy in acute appendicitis in a Palestinian government hospital [10].

This study was conducted to report on the postoperative complications after laparoscopic and open cholecystectomy in a Palestinian government hospital. The study also investigates associations between sociodemographic and surgical variables of the study patients and postoperative complications, duration of hospital stay, and duration of the surgical procedure.

METHODS

Design of the study

A retrospective observational design was used in the present study. In this study, patient records were identified and sampled from the surgical achieve files of the hospital from previous years [11, 12]. Surgical records of the patients who underwent laparoscopic or open cholecystectomy for gallbladder stones were searched, identified, reviewed, and included. The search centered on identifying patient variables relevant to the sociodemographic, surgical, hospital stay, and postoperative complications. The study site was one of the main hospitals in Hebron District, Palestine.

Selection process

Electronic files of the patient record system used at the hospital were searched to identify, select, and review the surgical records of the patients who were operated for gallbladder stones. The selection process did not exclude file in relation to the age, gender, and duration of the surgical procedure. The patient files were included once they contained all the pertinent information. Incomplete files and those lacking all pertinent information were excluded from the analysis. To achieve the objectives of this study, a convenience sampling procedure was followed and a convenience sample of 101 patient files that were complete and contained all pertinent information were included in the final analysis.

Collection of the data

A data collection form that was created for this study using an Excel Sheet (Microsoft Excel 2019, Microsoft Inc.) was used to collect the pertinent information needed for the analysis. The data needed for this study were entered directly into the data extraction form. Pertinent data needed for this

study were based on previous studies [10, 13, 14]. The data collected were related to age, gender, duration of the operation, duration of stay at the hospital, the surgical procedure followed, and the postoperative complications that were reported. The data were recorded into the data extraction form.

The pertinent data were collected by the main investigator into the data extraction form that was created for this study. Collection of data was ensured for accuracy and completeness by double checking the patient information from the patient surgical files. Patient files were accessed as many times as was needed to ensure accuracy and completeness of the data collected for this study.

Statistical analysis

To analyze the data collected in this study, IBM SPSS for Windows v.20.0 (IBM, Armonk, New York, US) was used. Normality of distribution was assessed by Kolmogorov–Smirnov test. Because the data were not normally distributed, the data were grouped into categories. Associations between categorical data were investigated using Chi-square (χ^2) or Fisher's exact test, as appropriate. Spearman's correlations were used to investigate the presence or absence of correlations between the variables. Medians with their interquartile ranges (IQR) were used to express central tendency. Differences in continuous variables were assessed using Mann-Whitney *U* test or Kruskal Willis test. When the p value was < 0.05, associations or differences were considered statistically significant.

Ethics

The ethical principles used in medical and clinical studies that involve the use of human subjects that were declared in the Declaration of Helsinki by the World Medical Association in 1964 and updated in 2013 were respected in this study. In the present study, none of the information used can lead to the identity of the patients. Coded information was used with complete anonymity during the data analysis and reporting of the results.

RESULTS

In the present retrospective study, 101 patient cases were included in the final analysis. Of the patients included, the majority (75.2%) were female in gender, more than half (53.5%) were between 40 and 60 years of age, the majority (88.1%) had laparoscopic cholecystectomy, the duration of operation lasted for 2 hours for the majority (79.2%) of the patients, and the majority (82.2%) of the patients were discharged in 2 or less days. The median age of the study patients was 43 with an IQR of 17 years. The duration of the surgical time ranged from 40 minutes to 3 hours and the duration of hospital stay ranged from 1 to 14 days. In this retrospective analysis, patients were discharged with antibiotics including azithromycin, ceftriaxone, metronidazole, and some analgesics. Details of the sociodemographic and clinical variables of the study patients are shown in Table 1.

Table (1): Sociodemographic and clinical variables of the study patients (*n = 101*).

Variable	n	%
Gender		
Male	25	24.8
Female	76	75.2
Age (in years)		
< 20	4	4.0
≥ 20 to < 40	36	35.6
≥ 40 to < 60	54	53.5
≥ 60	7	6.9
Surgical procedure		
Laparoscopic cholecystectomy	89	88.1
Open cholecystectomy	12	11.9
Postoperative complications		
No complications	87	86.1
Presence of complications	14	13.9
Duration of the surgical procedure (in hours)		
< 2	21	20.8
≥ 2	80	79.2
Duration of hospital stay (in days)		
≤ 2	83	82.2
> 2	18	17.8

Prevalence of postoperative complications

In this retrospective analysis, no postoperative complications were reported for the majority (n = 87, 86.1%) of the cases. However, the records showed prevalence of postoperative complications in 14 patients (13.9% of the cases). The complications reported ranged from common bile duct injury to atelectasis. Details of the postoperative complications that were reported in the 14 cases are shown in Figure 1 arranged in order of their prevalence.

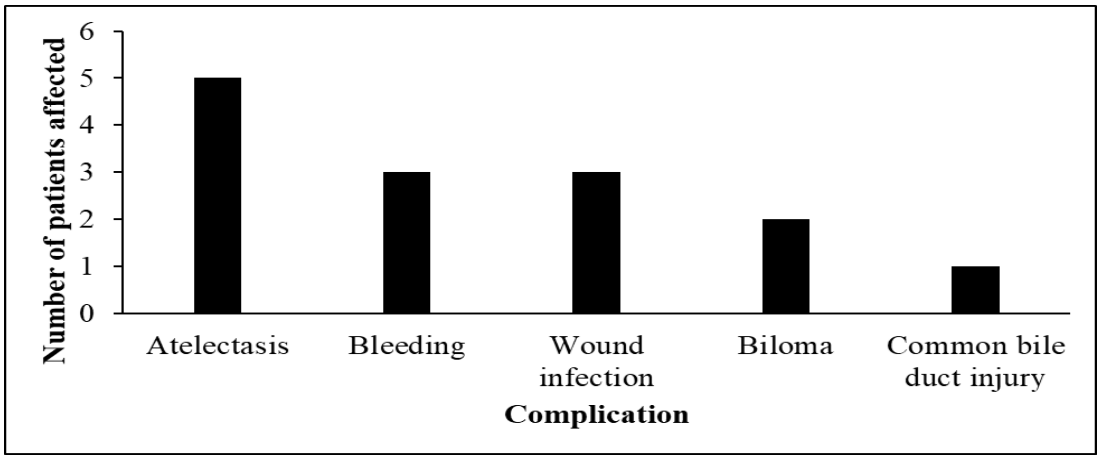

Figure (1): Prevalence of postoperative complications among the study patients (*n = 14*).

Association between prevalence of complications with sociodemographic and surgical variables of the study patients

In this retrospective analysis, postoperative complications were significantly associated with open cholecystectomy. Chi-square/Fisher's exact test (χ^2/Fisher's exact test = 8.73, p value = 0.011) and Spearman's rho showed that postoperative complications were significantly higher in patients who had open cholecystectomy compared with those who have had laparoscopic cholecystectomy (Spearman's rho = 0.30, p value = 0.003). Similarly, patients who have had postoperative complications stayed significantly longer duration in the hospital (χ^2/Fisher's exact test = 61.86, p value < 0.001; Spearman's rho = 0.79, p value < 0.001) compared with those who did not have postoperative complications. Associations between prevalence of complications with sociodemographic and surgical variables of the study patients are shown in Table 2.

Table (2): Association between prevalence of complications with sociodemographic and surgical variables of the study patients.

Variable	No complications		Presence of complications		χ^2 or Fisher's exact test	P value	Correlation	P value
Gender	**n**	**%**	**n**	**%**				
Male	20	80.0	5	20.0	1.04	0.326	-0.10	0.311
Female	67	88.2	9	11.8				
Age (in years)								
< 20	3	75.0	1	25.0	6.03	0.073	0.04	0.723
≥ 20 to < 40	31	86.1	5	13.9				
≥ 40 to < 60	49	90.7	5	9.3				
≥ 60	4	57.1	3	42.9				

Variable	No complications		Presence of complications		χ^2 or Fisher's exact test	P value	Correlation	P value
Surgical procedure								
Laparoscopic cholecystectomy	80	89.9	9	10.1	8.73	0.011	0.30	0.003
Open cholecystectomy	7	58.3	5	41.7				
Duration of the surgical procedure (in hours)								
< 2	18	85.7	3	14.3	0.00	1.000	-0.01	0.950
≥ 2	69	86.3	11	13.8				
Duration of hospital stay (in days)								
≤ 2	82	98.8	1	1.2	61.86	<0.001	0.79	<0.001
> 2	5	27.8	13	72.2				

Association between length of hospital stay with sociodemographic and surgical variables of the study patients

In addition to presence of postoperative complications (χ^2/Fisher's exact test = 61.86, p value < 0.001; Spearman's rho = 0.79, p value < 0.001), in this retrospective analysis, length of hospital stay was also associated with the type of surgical procedure. Patients who had open cholecystectomy stayed significantly longer duration at the hospital (χ^2/Fisher's exact test = 5.23, p value = 0.037; Spearman's rho = 0.23, p value = 0.021). Associations between duration of hospital stay with sociodemographic and surgical variables of the study patients are shown in Table 3.

Table (3): Associations between duration of hospital stay with sociodemographic and surgical variables of the study patients.

Variable	< 2 hours		≥ 2 hours		χ^2 or Fisher's exact test	P value	Correlation	P value
Gender	**n**	**%**	**n**	**%**				
Male	18	72.0	7	28.0	2.33	0.140	-0.15	0.128
Female	65	85.5	11	14.5				
Age (in years)								
< 20	4	100.0	0	0.0	6.51	0.041	0.19	0.054
≥ 20 to < 40	31	86.1	5	13.9				
≥ 40 to < 60	45	83.3	9	16.7				
≥ 60	3	42.9	4	57.1				
Surgical procedure								
Laparoscopic cholecystectomy	76	85.4	13	14.6	5.23	0.037	0.23	0.021
Open cholecystectomy	7	58.3	5	41.7				
Postoperative complications								
No complications	82	94.3	5	5.7	61.86	0.000	0.79	0.000
Presence of complications	1	7.1	13	92.9				

Variable	< 2 hours		≥ 2 hours		χ^2 or Fisher's exact test	P value	Correlation	P value
Duration of the surgical procedure (in hours)								
< 2	19	90.5	2	9.5	1.23	0.350	0.11	0.269
≥ 2	64	80.0	16	20.0				

Association between type of surgical procedure with other sociodemographic and surgical variables of the study patients

In this retrospective analysis, male patients have had significantly more open cholecystectomy compared to female patients (χ^2/Fisher's exact test = 4.61, p value = 0.041; Spearman's rho = -0.22, P value = 0.031). Similarly, older patients have had significantly more open cholecystectomy compared to younger patients (χ^2/Fisher's exact test = 12.50, p value = 0.003; Spearman's rho = 0.34, p value = 0.001). Associations between type of surgical procedure with sociodemographic and surgical variables of the study patients are shown in Table 4.

Table (4): Associations between type of surgical procedure with sociodemographic and surgical variables of the study patients.

Variable	Laparoscopic cholecystectomy		Open cholecystectomy		χ^2 or Fisher's exact test	P value	Correlation	P value
Gender	**n**	**%**	**n**	**%**				
Male	19	76.0	6	24.0	4.61	0.041	-0.22	0.031
Female	70	92.1	6	7.9				
Age (in years)								
< 20	4	100.0	0	0.0	12.50	0.003	0.34	0.001
≥ 20 to < 40	36	100.0	0	0.0				
≥ 40 to < 60	45	83.3	9	16.7				
≥ 60	4	57.1	3	42.9				
Postoperative complications								
No complications	80	92.0	7	8.0	8.73	0.011	0.30	0.003
Presence of complications	9	64.3	5	35.7				
Duration of the surgical procedure (in hours)								
< 2	17	81.0	4	19.0	1.29	0.267	-0.11	0.259
≥ 2	72	90.0	8	10.0				
Duration of hospital stay (in days)								
≤ 2	76	91.6	7	8.4	5.23	0.037	0.23	0.021
> 2	13	72.2	5	27.8				

Association between length of the surgical procedure with sociodemographic and surgical variables of the study patients

Length of the surgical procedure was significantly higher for older patients compared to younger patients (χ^2/Fisher's exact test = 7.30, p value = 0.043; Spearman's rho = 0.21, p value = 0.036). Associations between length of the surgical procedure with sociodemographic and surgical variables of the study patients are shown in Table 5.

Table (5): Associations between length of the surgical procedure with sociodemographic and surgical variables of the study patients.

Variable	< 2 hours		≥ 2 hours		χ^2 or Fisher's exact test	P value	Correlation	P value
Gender	**n**	**%**	**n**	**%**				
Male	3.00	12.00	22.00	88.00	1.56	0.266	-0.12	0.216
Female	18.00	23.68	58.00	76.32				
Age (in years)								
< 20	3.00	75.00	1.00	25.00	7.30	0.043	0.21	0.036
≥ 20 to < 40	9.00	25.00	27.00	75.00				
≥ 40 to < 60	8.00	14.81	46.00	85.19				
≥ 60	1.00	14.29	6.00	85.71				
Surgical procedure								
Laparoscopic cholecystectomy	17.00	19.10	72.00	80.90	1.29	0.267	-0.11	0.259
Open cholecystectomy	4.00	33.33	8.00	66.67				
Postoperative complications								
No complications	18.00	20.69	69.00	79.31	0.00	1.000	-0.01	0.950
Presence of complications	3.00	21.43	11.00	78.57				
Duration of hospital stay (in days)								
≤ 2	19.00	22.89	64.00	77.11	1.23	0.350	0.11	0.269
> 2	2.00	11.11	16.00	88.89				

Association between age and other surgical variables of the study patients

In this study, male patients who have had cholecystectomy were older than female patients who have had cholecystectomy (Spearman's rho = -0.36, p value < 0.001). Female patients had more open cholecystectomy compared to male patients (Spearman's rho = 0.27, p value = 0.007). Similarly, female patients had longer duration of surgical procedures compared to male patients (Spearman's rho = 0.23, p value = 0.018). Again, female patients stayed longer duration in the hospital compared to male patients (Spearman's rho = 0.24, p value = 0.015). Associations between age and other surgical variables of the study patients are shown in Table 6.

Table (6): Associations between age and other surgical variables of the study patients.

Variable	n	Median	IQR	Mean rank	P value	Correlation	P value
Gender							
Male	25	50.0	11.0	69.0	<0.001	-0.36	<0.001
Female	76	40.0	16.5	45.1			
Surgical procedure							
Laparoscopic cholecystectomy	89	40.0	17.0	48.2	0.008	0.27	0.007
Open cholecystectomy	12	50.5	22.5	72.1			
Postoperative complications							
No complications	87	43.0	17.0	50.2	0.497	0.07	0.500
Presence of complications	14	45.0	22.3	55.9			

Variable	n	Median	IQR	Mean rank	P value	Correlation	P value
Duration of the surgical procedure (in hours)							
< 2	21	33.0	21.5	37.7	0.019	0.23	0.018
≥ 2	80	44.5	17.0	54.5			
Duration of hospital stay (in days)							
≤ 2	83	40.0	17.0	47.7	0.016	0.24	0.015
> 2	18	50.0	22.0	66.1			

DISCUSSION

This study reports for the first time on the outcomes of cholecystectomies performed in one of the main hospitals in Hebron District. The study also reports for the first time on associations between some patient variables like gender, age, postoperative complications, type of surgical procedure, duration of the surgical procedure, and duration of hospital stay.

Although the sample size used in this study was relatively small compared to studies reported elsewhere, the present study included patients from both genders, different age groups, and patients who were operated using open as well as laparoscopic procedures. This diversity might add relevance and width to the results reported in this study.

In this study, the majority (75.2%) of the patients were female in gender. Previous studies have shown that being female in gender, being obese, and of older age are the classic risk factors for gallstone disease [2]. Our results were consistent with those reported previously. It is noteworthy mentioning that in this study, female patients were significantly younger than male patients.

Findings of this study showed that the majority (88.1%) of the patients underwent laparoscopic cholecystectomy. Since its inception, laparoscopic cholecystectomy has evolved as the standard of care in the management of symptomatic cholelithiasis [7]. Findings of this study indicate consistency between the standard of care practiced in Palestine with the surgical practice elsewhere in the world as open cholecystectomy is used when the laparoscopic procedure cannot be used.

In this study, absence of postoperative complications was evident in the majority of cases (86.1%). However, no surgical procedure is completely free from complications, as even minor operations could carry risks for complications [15, 16]. Findings reported in this study were comparable with those reported in a larger study by Radunovic et al in which complications were prevalent in 13.1% [16]. In this study, complications were reported for 13.9% of the cases.

Atelectasis was the most commonly reported complication in this study. Similar to previous studies conducted elsewhere, atelectasis was one of the commonly reported complication after surgeries including cholecystectomies [17-19]. Bleeding and wound infections were also reported among the complications of the cholecystectomies performed for the patients included in this study. Bleeding and wound infections are common postoperative complications associated with surgeries [16]. Cholecystectomies are generally considered safe. Even in open cholecystectomies, the overall mortality rate is less than 1% [20, 21].

In general, laparoscopic cholecystectomies were associated with decreased hospital stay, hospital stay period, and reduced risk of postoperative complications compared to open cholecystectomies [16]. Findings of this study were consistent with those reported in previous studies and patients who underwent open procedures had significantly more postoperative complications compared to patients who underwent laparoscopic procedures. Similarly, duration of stay in the hospital was significantly longer for open cholecystectomies compared to laparoscopic cholecystectomies. Again, patients who have had postoperative complications stayed significantly longer duration at the hospitals compared to patients who have had no postoperative complications. Findings of this study were consistent with those reported elsewhere [16, 20, 22].

Previous studies have shown that women tended to have more gallbladder disease compared to men. Findings of this study were consistent with this regard [6, 15, 23, 24]. Although women tend to have more gallbladder disease compared to men, in this study, older patients have had more open cholecystectomy compared to younger patients. The surgical procedure was significantly longer for older compared to younger patients. Findings of this study were consistent with those reported previously [15, 25, 26].

Limitations of the study

Findings of this study might be interpreted considering the following limitations. First, the sample size used in this study was relatively small. Previous studies have reported results using larger sample sizes. However, in this study, the sample had patients from both genders, different age groups, and patients who underwent both open and laparoscopic procedures. Second, this study was a retrospective analysis. Prospective designs are considered superior to retrospective designs with regard to strength of evidence. Third, although postoperative complications were collected, postoperative pain was not collected. Probably, major complications requiring extended hospital stay were recorded in the patient files. Designing another investigation to prospectively collect postoperative outcomes with relation to postoperative pain and following patients up for a period of time till recovery add width and strength to future studies. Finally, this study was based on data collected from the patient files. However, for such studies, data collected by direct observation would be considered superior to the data collected from the patient files. The risk of bias from incorrect data entry cannot be eliminated.

CONCLUSIONS

In conclusion, laparoscopic cholecystectomies are the standard of practice in managing gallstone disease in Palestine. Prevalence rates of postoperative complications were comparable to those reported elsewhere in the literature. Laparoscopic cholecystectomies were associated with reduced postoperative complications, surgical operation time, and hospital stay similar to those reported previously. More studies are still needed to analyze and compare pain and speed of recovery after laparoscopic cholecystectomies in Palestine.

CONFLICT OF INTERESTS

None.

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