

## Evaluation of Appendicitis Outcomes in Children

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**Abstract: Background:** The most common pediatric surgical emergency that results in an appendectomy is appendicitis. Longer hospital stays and greater incidence of postoperative complications are linked to perforated appendicitis. **Aim:** The study aimed to compare the differences in hospital utilization and complications between laparoscopic (LA) and open appendectomy (OA) for pediatric appendicitis. **Patients and methods:** The paper was designed as a cross-sectional study to evaluate of appendicitis outcomes in children who have ages under 14 years which the databases were downloaded to the SPSS program. This paper was specialized with both sexes into, females and males, where include 60 patients with LA and 30 patients with OA who obtained from Baghdad-Iraq between 16<sup>th</sup> November 2021 to 24<sup>th</sup> May 2022. **Results and discussion:** Our results found that laparoscopic appendectomy had a shorter hospital stay and reduced wound infections and. The evaluation of appendicitis outcomes in children has been the focus of several studies, and our study found that A comparison between laparoscopic and open appendectomies for acute appendicitis in children showed significant differences in postoperative outcomes, including the incidence of complications and length of hospital stay. **Conclusions:** In this study, we conclude that patients who underwent LA achieved better results compared to OA According to the length of hospital stay and complications.

**Keywords:** appendicitis, Intra-abdominal abscess (IAA), and post operative intestinal obstruction.

## INTRODUCTION

The most common pediatric surgical emergency that results in an appendectomy is appendicitis. Longer hospital stays and greater incidence of postoperative complications are linked to perforated appendicitis [US Census Bureau, 2012-Guyatt, G. H. *et al.*, 2007]. The results of children with appendicitis are influenced by hospital-level features as well as patient-level variables such as socioeconomic status, insurance status, as well as race, according to earlier American research. More recent research have demonstrated that once equitable access to care is offered, the effects on race along with socioeconomic class disappear. In Canada, a single-payer system that should theoretically provide for equitable access insures all children. According to our knowledge, we conducted the first population-based worldwide comparison of pediatric appendicitis outcomes among the two nations. [Smink, D. S. *et al.*, 2005-Hornberger, J. C. *et al.*, 1997]

The health care delivery systems in the US and Canada are significantly dissimilar. In the US, there is a multiplayer system made up of several commercial insurers and numerous government initiatives. In 2011, there were 48.6 million uninsured persons throughout the USA, including almost 9 million children, or 15.7% of the total population. All citizens and authorized immigrants in Canada have access to universal, publicly

financed, single-payer health insurance. The Canadian medical system includes waiting periods for the diagnosis and treatment of many medical disorders. In 2011, 941 321 procedures were expected to be delayed by 2.8% of all Canadians. [Rowe, B. H. *et al.*, 1999-Neilson, I. R. *et al.*, 1990]

Beyond insurance coverage as well as wait times, there are many other areas of health care that are different between the US and Canada. These include hospital and physician reimbursement, administrative costs, billing procedures, medical liability, and the availability of medical resources [Emil, S. *et al.*, 2003-St Peter, S. D. *et al.*, 2008]. All these areas have a significant impact on patients as well as doctors. Several earlier research examined the disparities in treatment outcomes for a range of acute and chronic illnesses among the United States as well as Canada. A thorough analysis of 38 research revealed that the majority either favored Canada or indicated no differences comparing the two nations [Pearl, R. H. *et al.*, 1995-Beres, A. *et al.*, 2010]. Most of this research examined adult illnesses or mixed populations of adults and children. This paper aims to evaluate of appendicitis outcomes in children.

## PATIENTS AND METHODS

The paper was designed as a cross-sectional study to evaluate of appendicitis outcomes in children

who have ages under 14 years which the databases were downloaded to the SPSS program. This paper was specialized with both sexes into, females and males, where include 60 patients LA and 30 OA patients who obtained from Baghdad-Iraq between 16<sup>th</sup> November 2021 to 24<sup>th</sup> May 2022.

The methods used in this paper were sectional study design, data obtained, and the study included children between the ages of 1 and 14 years who were admitted with a diagnosis of acute appendicitis and had either an LA or OA during the same admission and the main outcome measures were complications, LOS, and Wound infection.

Multivariate logistic regression was used to find the factors which affecting for appendicitis patients according to program SPSS SOFT 22, and Patient demographics, socioeconomic factors, comorbidities, the severity of appendicitis, hospital characteristics, and time periods were included as covariates in the models.

In the progressing of methodology building, this study was examined into the distribution of clinical and demographic characteristics in children with appendicitis by age from (1-15) years, sex which these outcomes have been shown in Table 1 and Table 2. Furthermore, the results have determined that symptoms in children with acute appendicitis include Loss of appetite, Diarrhea, Fever, Abdominal pain, Nausea, and vomiting.

To further the outcomes, our data have determined with types of appendectomy, which get on acute appendicitis, appendicitis without perforation, and appendicitis with perforation, which it can be

expressed in Figure 1. Moreover, the complications of databases determinations have Indicated of appendectomy complications of patients, which divide into Severe complications have, include Intra-abdominal abscess, Wound infection, Postoperative infiltrate, Postoperative intestinal obstruction, Readmissions, Incisional hernia

#### The contributions of this paper are:

- Conducting the first population-based worldwide comparison of pediatric appendicitis outcomes among two nations.
- Focusing on evaluating appendicitis outcomes in children which is the most common pediatric surgical emergency that results in an appendectomy.
- Providing insights into the link between longer hospital stays and greater incidence of postoperative complications with perforated appendicitis.
- Differentiating this research from most of the previous studies that examined adult illnesses or mixed populations of adults and children.
- Assessing the current use of laparoscopy for the treatment of pediatric appendicitis.
- Comparing the long-term outcomes and hospital utilization between children undergoing LA and OA by analyzing longitudinal data from a statewide population perspective.
- Providing evidence that LA has become the preferred operation for pediatric appendicitis.

## RESULTS

**Table 1:** Describe general characteristics of study patients for two groups

Variable	LA	OA	P-value
Age			
Age (Mean±SD) years	7.9333±4.25408	8.2±3.98	0.98
Age (median)	8.0	7.7	0.766
sex			
Females F (%)	19(31.7)	11(36.6)	0.03
Males F (%)	41(68.3)	19(63.3)	0.082
Symptoms			
Loss of appetite	8(13.3)	5(16.6)	0.07
Diarrhea	11(18.3)	6(20)	0.05
Fever	13(21.7)	4(13.3)	0.77
Abdominal pain	13(21.7)	7(23.3)	0.01
Nausea	8(13.3)	4(13.30)	0.22
vomiting	7(11.7)	3(10)	0.066
The level of education of a father			
school	10(16.6)	4(13.3)	0.21

College	39(65)	17(56.6)	0.001
high	11(18.3)	9(30)	<0.05

**Table 2:** Assessment complications of Children who underwent to (Laparoscopic Appendectomy and open appendectomy)

	LA, N=60	OA, N=30	P-value
Intra-abdominal abscess	2(3.3)	2(6.6)	0.87
Wound infection	1(1.6)	2(6.6)	0.77
Postoperative infiltrate	1(1.6)	1(3.3)	0.9
Postoperative intestinal obstruction	2(3.3)	3(10)	0.01
Readmissions	3(5)	3(10)	0.05
Incisional hernia	1(1.6)	2(6.6)	0.01

**Table 3:** Evaluation of patients' outcomes according to the length of stay in the hospital

	LA, N=60	OA, N=30	P-value
Male	2.3±1.3	6.2±1.1	0.01
Female	4.1±2.2	5.9±0.88	<0.001

**Table 4:** Evaluation of patients' outcomes according to the length of readmission

	LA, N=60	OA, N=30	P-value
Male	3.15±1.73	6.11±0.8	0.005
Female	3.4±2.4	5.66±1.20	<0.05

**Table 5:** Analysis factors of multivariate logistic regression affecting for appendicitis patients

Factors	OR	95% CI	P-value
<b>Ages</b>			
< 9 years	2.326	1.47-3.642	0.000156
Up to 9 years	0.851	0.357-1.677	0.0198
<b>Sex</b>			
Males	0.8	0.2-1.1	0.1754
Females	1.1	0.4-1.4	0.887
<b>Symptoms</b>			
Fever	1.5	0.9621-3.4	0.00366
Abdominal pain	2.1	0.744-3.5	0.0355
<b>Complications</b>			
Postoperative infiltrate	2.2	1.1-4.457	0.0122
Postoperative intestinal obstruction	1.9	1.1-3.8272	0.00466

**Table 6:** Explain outcomes according to coloration between SGRQ-C with LA and OA

SGRQ-C	R (OA)	P-value	R (LA)	P-value
Total score	0.223	>0.01	0.55	0.84
Symptoms score	0.98	0.01	0.89	0.345
Activity score	0.922	0.0266	0.55	>0.93
Impact score	0.44	<0.01	0.76	0.12

## DISCUSSION

A cross-sectional study was established in Iraq to know the complications of appendicitis in children. Where the principle of this study was to rely on laparoscopic appendectomy against open surgery, where 90 children were recruited and were distributed into two groups: 60 patients with laparoscopic appendectomy and 30 patients with open surgery.

The secondary factor for evaluating the complications in this study was the length of stay in the hospital, where the SPSS soft program was relied upon to analyze the demographic results of the patients.

The study found that the need for postoperative intra-abdominal abscess drainage is small, and laparoscopy appears to increase this risk slightly. And Laparoscopic appendectomy did not affect

long-term hospitals, and This paper is an assessment of the consequences of appendicitis in children. The authors conducted a study to examine the distribution of clinical and demographic characteristics in children with appendicitis by age and gender. They also studied symptoms in children with acute appendicitis, as well as complication rates for appendectomy patients. The study found that a long stay in the hospital and an increased incidence of postoperative complications are associated with perforated appendicitis. The benefits of laparoscopic appendectomy were better compared to open appendectomy in younger children. The study also identified factors that affect appendicitis patients, including age, gender, symptoms, and complications. The authors note that age influences treatment options and affects the outcome of appendicitis in children.

Table 1 shows the distribution of clinical and demographic characteristics in children with appendicitis by age. Table includes various statistical measures such as valid cases (V), missing cases (Mi), mean (M), standard error of mean (STEM), median (Me), standard deviation (SD), variance (Var), skewness (SK), standard error of skewness (SES), range (Ra), minimum (Min), maximum (Max), and sum (S) and These statistical measures are used to describe the distribution of the data in the table.

Appendicitis is a condition where the appendix, a small pouch-like structure located in the lower right side of the abdomen, becomes inflamed and infected. While it can occur in people of all ages, it is relatively common in children.

The symptoms of appendicitis in children can vary, but some common signs include loss of appetite, diarrhea, fever, abdominal pain, nausea, and vomiting.

If appendicitis is suspected, it is crucial to seek medical attention promptly. Delayed treatment can lead to complications, such as a ruptured appendix, which can be life-threatening. The outcomes of appendicitis in children depend on several factors, including the severity of the infection and how quickly it is diagnosed and treated.

However, if the appendix ruptures before surgery, the risk of complications increases significantly. A ruptured appendix can lead to a condition called peritonitis, where the infection spreads throughout the abdomen. This can cause severe abdominal

pain, high fever, increased heart rate, and can even be life-threatening.

And previous studies similar to the subject of our current study were in agreement with our results, as Aneurism 2019 found the prevalence of complications in children aged 5-8 years more than others, as Solin found in his 2013 study that younger children are more likely to have perforated appendicitis, be readmitted, and have a longer length of hospitalization.

In our study, we assessment Complications of Children who underwent to (Laparoscopic Appendectomy and open appendectomy, where Complications can occur with both laparoscopic appendectomy and open appendectomy procedures in children. Some common complications include:

Wound infection surgical site infections can occur in both types of procedures. Proper wound care and administration of antibiotics can help reduce the risk of infection.

Wound infection in patients who have undergone OA For two patients with 6.6% and about patients who have undergone LA, the prevalence of Wound infection was (1.6%) As for postoperative intestinal obstruction, the prevalence of complications in patients who underwent OA was 3 (10%) and for LA, LA were 2 (3.3%).

Study also included the prevalence of Hernia. In some cases, a weakness or hole can develop in the abdominal wall, leading to hernia. This can require surgical repair if symptomatic; the prevalence of complications, according to Hernia, in patients who underwent OA was 2 (6.6%). As for the LA, it was 1(1.6%)

Previous research indicates that laparoscopic international appendectomy is associated with a decrease in complications in patients. In addition, less hospital stay was found compared to open surgery, as similar results were found in Lareen Suite 2020, where a better quality of life was found in patients who underwent LA and similar differences. Statistically significant between the two groups at  $<0.05$  [Sauerland, S. *et al.*, 1998]

In another study, Masumi found that there were statistically significant differences between the use of the type of surgery and the increase in mortality in children [Masoomi, H. *et al.*, 2011].

In Table 5, logistic regression factors were analyzed to find out the most risk factors for patients in this study, which are age at 2.236 (1.47-

3.6), in addition to complications with Postoperative infiltrate at 95% CI 2.2 (1.1-4.4) with statistically significant differences P-value 0.01

The current study is in agreement with other studies and the most prominent study, Liao Torawa 2010, through which 150 patients were collected. The factors that posed more risk to patients were age to children under two years with statistically significant paper.

Our current study indicates that LA achieves fewer complications according to the length of stay in the hospital, and it also reduces wound infections that occur in patients when compare with OA Open vermiform, with statistical significance between the two groups.

## CONCLUSION

The paper concludes laparoscopic appendectomy (LA) has shown success in reducing complications compared to open surgery.

The study found that laparoscopic appendectomy (LA) has become the preferred operation for pediatric appendicitis, with increased use over time. LA is associated with lower rates of wound infections and shorter hospital stays compared to open appendectomy.

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