

# Impact of Delayed Pre-operative Investigations on Complications of Appendicectomy: A Retrospective Study

Saif ur Rahman<sup>1</sup>, Mohammad Usman<sup>1</sup> and Anwar Syed<sup>2</sup>

Pre-operative  
Investigations on  
Complications of  
Appendicectomy

## ABSTRACT

**Objective:** This study aims to assess the relationship between delayed pre-operative investigations and the incidence of complications in patients undergoing appendicectomy.

**Study Design:** A Retrospective Study

**Place and Duration of Study:** This study was conducted at the Department of General Surgery in Saidu Group of Teaching Hospitals and Swat Medical Complex Teaching Hospital, Saidu Sharif, Swat, from 1<sup>st</sup> January 2021 to 30<sup>th</sup> June 2021.

**Materials and Methods:** A total of 120 patients, aged 20 to 50 years, were enrolled using a non-random convenient sampling technique. Participants were categorized into two groups: a "Delayed Investigations" group (delayed by more than 12 hours) and a "Non-Delayed Investigations" group. Both groups were observed for two days, and data were collected and analyzed using SPSS version 24.

**Results:** Out of the 120 participants, 73 (60.83%) were male and 47 (39.16%) were female. The age distribution ranged from 21 to 40 years (49.16%), with a mean age of  $33.87 \pm 1.89$ . A total of 53 cases (44.16%) experienced delays of more than 12 hours in pre-operative investigations, while 67 cases (55.83%) did not face delays. Notably, the delayed group exhibited a higher incidence of complications, particularly perforation (35%), compared to the non-delayed group (4.10%). The mean hospital stay in the delayed group was  $3.72 \pm 2.72$  days, whereas in the non-delayed group, it was  $1.97 \pm 1.21$  days.

**Conclusion:** This study establishes a clear association between delayed pre-operative investigations and heightened complications in appendicectomy cases. Notably, delays exceeding 12 hours demonstrated a significant impact, leading to complications such as perforation, peritonitis, extended hospital stays, and post-operative infections. However, delays within the initial 12 hours did not exhibit a substantial effect on complications. These findings underscore the importance of timely pre-operative investigations in enhancing patient outcomes and minimizing the risk of adverse post-operative events.

**Key Words:** appendicectomy, perforation, peritonitis, pre-operative investigations.

**Citation of article:** Rahman S, Usman M, Syed A. Impact of Delayed Pre-operative Investigations on Complications of Appendicectomy: A Retrospective Study. Med Forum 2023;34(8):188-192. doi:10.60110/medforum.340844.

## INTRODUCTION

Acute appendicitis stands as a pervasive ailment, affecting one out of every seven individuals during their lifetime, positioning it as one of the foremost reasons for emergency surgical hospitalizations.<sup>1</sup>

<sup>1</sup>. Department of Surgery, Swat Medical College Saidu Sharif Swat, KPK.

<sup>2</sup>. Department of Surgery, Swat Medical Complex Teaching Hospital Swat, KPK.

Correspondence: Mohammad Usman, Swat Medical Complex Teaching Hospital Swat, KPK / Assistant Professor, Department of Surgery, Swat Medical College Saidu Sharif Swat, KPK.

Contact No: 03321510044

Email: usmanfrs@outlook.com

Received: March, 2023

Accepted: May, 2023

Printed: August, 2023

Among the gamut of non-elective procedures, appendicectomy emerges as the surgery most frequently undertaken by general surgeons.<sup>2</sup> Timely intervention through surgical removal of the inflamed appendix is imperative in acute appendicitis, necessitating expeditious action within hours of diagnosis to curtail the risk of complications.<sup>3</sup> Referred to as "immediate appendectomy," this medical intervention is considered the cornerstone of managing acute appendicitis, with delays in diagnosis and treatment being associated with an elevated incidence of appendix perforation and subsequent exacerbated patient conditions.<sup>4</sup>

Failure to promptly diagnose and intervene can amplify both disease severity and mortality rates. In particular, older individuals face a mortality rate exceeding 20%, attributing this grim statistic to delays in diagnosis, hospitalization, and therapeutic intervention.<sup>5</sup> With a confluence of concurrent medical conditions and a spectrum of patient variability within this demographic, multifactorial contributions are at play.<sup>6</sup> Delays in diagnosis and inadequate medical attention can stem

from diverse sources, including at-home delays, local healthcare providers, traditional remedies, alternative medicine seekers, and even healthcare practitioners. An advanced appendiceal case can precipitate fatal outcomes, extended hospital stays, and financial strain. Differential diagnoses encompassing conditions like urinary tract infections, pelvic inflammatory ailments, ovarian cysts, and gastroenteritis can further confound timely diagnostic decisions, especially when compounded with generalized abdominal pain concerns.<sup>7</sup>

Appendectomy, the emergent surgical solution to treat this pressing clinical scenario, occupies a unique position as both a rare surgical emergency and one of the most frequently performed surgical interventions overall.<sup>8,9</sup> Appendicitis, a prevailing cause of acute abdominal pain across all age groups, inherently underscores the urgency of its management. The condition carries substantial morbidity and mortality risks, particularly in its advanced stages where complications such as appendiceal rupture can arise. The severity of these complications, coupled with their frequency, hinges on factors encompassing immune status, underlying etiology of appendicitis, and individual health profiles. The death rate post-appendectomy varies from 0% to 2.4%, with the fatality rate notably reduced when the procedure is uncomplicated. While the incidence of appendicitis registers at 0.8 per 1,000 individuals, the incidence of more severe cases, including perforation, is recorded at 5.1 per 1,000 individuals.<sup>10</sup>

Evident consensus highlights the correlation between delayed diagnosis, surgical intervention, and escalated morbidity and mortality rates. Yet, ongoing debates persist, especially pertaining to the intricacies of pre-admission and post-admission delays that contribute to these outcomes.<sup>10</sup> In this context, empirical research addressing the ramifications of delaying pre-operative diagnosis in acute appendicitis remains limited. This study, therefore, undertakes an evaluation of the complication rates stemming from delayed pre-operative diagnosis among patients with appendicitis, contributing valuable insights to this critical facet of surgical management.

In conclusion, this initial exploration into the intricate interplay between pre-operative investigation delays and appendectomy outcomes offers a promising foundation for deeper investigation. The gender-diverse participant composition, coupled with the distinct age distribution, highlights the potential for varied responses to delayed diagnosis. As we delve further into this study, the pronounced discrepancy in complication rates, exemplified by the elevated incidence of perforation in the delayed group, substantiates the pressing need for timely pre-operative assessments. The subsequent variation in hospital stays between the two groups further emphasizes the tangible

impact of delays on patient experiences. This study, poised at the nexus of timing and surgical outcomes, lays the groundwork for future research endeavors aimed at refining surgical protocols and optimizing patient care.

## MATERIALS AND METHODS

The present descriptive study was undertaken at Saidu Group of Teaching Hospitals and Swat Medical Complex Teaching Hospital in Saidu Sharif, Swat, Pakistan, specifically within the Department of General Surgery. The study was conducted within the timeframe spanning from January 1st to June 30th, 2021, subsequent to obtaining ethical clearance from the institutional review board. The sampling approach employed was a non-random convenient sampling technique, encompassing a total of 120 patients. The inclusion criterion was defined by an age range of 20 to 50 years, while patients with chronic conditions such as diabetes mellitus, pregnant females, and those diagnosed with gangrenous appendicitis were excluded. Prior to their inclusion, all participants were duly informed about the study's purpose, and individual informed consent was acquired from each participant, ensuring ethical compliance. Demographic data and other pertinent details were gathered through a standardized proforma from each participant, including records of pre-surgery investigations. The study population was categorized into two distinct groups: those with delayed pre-operative investigations and those without delays. In this classification, a delay exceeding 12 hours was considered indicative of the delayed group. Importantly, no adverse impact was noted for delays within the initial 12 hours across both groups.

Subsequent to their respective surgeries, participants from both groups were subjected to a comprehensive post-operative comparison, with a significant focus on identifying any negative implications stemming from the delay within the first 12 hours. Throughout this observational period, spanning two days, routine care and medication were consistently provided to ensure standardization. The collection of relevant data, encompassing clinical parameters and investigation reports, was meticulously undertaken. To ensure robust analysis, the collected data were meticulously processed using the latest iteration of SPSS, version 24. This comprehensive methodology serves as the bedrock for drawing meaningful insights into the association between delayed pre-operative investigations and appendectomy outcomes.

## RESULTS

In the context of this study, a total of 120 participants were meticulously selected, with 73 (60.83%) identified as male and 47 (39.16%) as female. The participants' age spectrum ranged from 20 to 50 years,

encompassing a diverse distribution. Specifically, 59 (49.16%) participants were aged between 21 and 40 years, while 49 (40.83%) were aged between 20 and 30 years, reflecting a mean age of  $33.87 \pm 1.89$ , as illustrated in Table No. 01.

Table #02 effectively highlights the prevalence and rationale behind appendectomy delays. Among the total cases, 53 (44.16%) experienced delays exceeding 12 hours attributed to pre-operative investigations, while 67 (55.83%) were characterized by timely appendectomy procedures. Notably, the primary cause for surgical delay was ascribed to pre-operative investigations. In terms of surgical approach, 69 (57.50%) cases underwent laparoscopic surgery, while 51 (42.50%) opted for open appendectomy.

The postoperative complications in both groups, differentiating between those subjected to delayed pre-operative investigations and those undergoing on-time appendectomy, are succinctly summarized in Table #03. Of significance, the delayed group exhibited a notably higher incidence of the most common complication, perforation, affecting 42 cases (35%), in contrast to the corresponding figure of 5 cases (4.10%) in the non-delayed group. Subsequent to this, post-operative infection emerged as a consequential complication, impacting 18 cases (15%) in the delayed group and 8 cases (6.66%) in the non-delayed group. Additionally, peritonitis manifested as the third most prevalent complication, affecting 19 cases (15.08%) in the delayed group and merely 2 cases (1.66%) in the

non-delayed group. The contrast in mean hospital stay duration further substantiated the impact of delays, with the delayed group necessitating a longer hospitalization period, demonstrated by a mean stay of  $3.72 \pm 2.72$  days, while the non-delayed group exhibited a mean stay of  $1.97 \pm 1.21$  days.

**Table No. 1: Distribution of Participants' Demographic Characteristics by Age Groups and Gender**

Age (years)	Number	Percentage
20-30	49	40.83 %
21-40	59	49.16 %
41-50	12	10 %
<b>Gender</b>		
Male	73	60.83 %
Female	47	39.16 %

**Table No. 2: Frequency and Reasons for Delayed Appendectomy, and Type of Surgical Approach**

Delayed appendectomy	Number	Percentage
Delayed	53	44.16 %
Not delayed	67	55.83 %
<b>Reason for delay</b>		
Pre-operative investigation	53	100 %
<b>Type of surgery for appendectomy</b>		
Laparoscopic	69	57.50 %
Open	51	42.50 %

**Table No. 3: Comparison of Post-operative Complications between Delayed and Not Delayed Appendectomy Groups**

Complications	Delayed (group 1) N= 53	Not delayed (group 2) N= 67	P value
Peritonitis	19 (15.83 %)	2 (1.66 %)	0.013
Perforation	42 (35 %)	5 (4.10 %)	0.035
Post-op infection	18 (15 %)	8 (6.66 %)	0.001
Abscess	9 (7.50%)	3 (2.50%)	0.06
Hospital stays (mean)	$3.72 \pm 2.72$	$1.97 \pm 1.21$	0.04

**DISCUSSION**

The urgency of appendectomy in the context of acute appendicitis is paramount, with the primary goal being the prevention of the escalation of inflammation and its associated complications. Recent advancements in antibacterial medications have led to discussions about the timing of appendectomy, suggesting that interval appendectomy might offer improved outcomes compared to immediate surgery.<sup>11</sup> Appendectomy remains a vital non-elective surgical procedure, commonly performed by general surgeons, with the urgency attributed to the potential for rapid disease progression and complications.<sup>12</sup>

Our study's participant demographics revealed a male predominance, comprising 73 (60.83%) males and 47 (39.16%) females, with ages ranging from 20 to 50

years. The age distribution highlighted 49.16% of participants falling within the 21-40 age range, and 40.83% between 20-30 years, yielding a mean age of  $33.87 \pm 1.89$  years. These findings are in line with prior investigations and reaffirm the typical age distribution of acute appendicitis cases.<sup>12,13</sup> In our cohort, a significant proportion of 53 (44.16%) cases experienced delays of more than 12 hours in pre-operative investigations, while 67 (55.83%) cases did not encounter such delays. Notably, pre-operative investigations were identified as the principal cause of surgical delay. The surgical approach was skewed towards laparoscopic appendectomy, performed in 69 (57.50%) cases, compared to 51 (42.50%) cases that underwent open appendectomy.

Upon examining post-operative complications, compelling disparities emerged between the two

groups. Perforation emerged as the most prevalent complication in the delayed group, affecting 42 (35%) cases, a stark contrast to the non-delayed group, where the incidence was just 5 (4.10%). Similarly, post-operative infections were considerably more frequent in the delayed group, accounting for 18 (15%) cases, compared to 8 (6.66%) cases in the non-delayed group. Peritonitis, a serious complication, was significantly more common in the delayed group with 19 (15.83%) cases, whereas only 2 (1.66%) cases occurred in the non-delayed group. Furthermore, the mean length of hospital stay was considerably prolonged in the delayed group ( $3.72 \pm 2.72$  days) in comparison to the non-delayed group ( $1.97 \pm 1.21$  days).

These findings resonate with research, where delayed appendectomy cases accounted for 24.83%, primarily due to misdiagnosis (47.22%), procedural fear (27.78%), and self-medication (18.06%). Their study demonstrated higher rates of perforation, longer hospital stays, and elevated rates of wound infection among delayed cases. This underscores the critical importance of timely surgical intervention and accurate diagnosis in managing acute appendicitis.

A separate study by Nisar et al reported on peri-appendiceal abscesses (2.6%) and peritonitis cases, with a substantial delay observed in 40.03% of instances, often leading to significant complications.<sup>14</sup>

In sum, our study serves as a clarion call for the timely management of acute appendicitis, emphasizing the profound impact of pre-operative investigation delays on post-operative complications and patient outcomes. Surgeons and healthcare professionals should be cognizant of these findings, advocating for expedited diagnostic and therapeutic pathways to mitigate the risk of complications such as perforation, infection, and prolonged hospitalization. Furthermore, future studies should focus on elucidating effective strategies to streamline the pre-operative investigative phase to optimize patient care and outcomes.

## CONCLUSION

In conclusion, our study sheds light on the critical significance of timely intervention and the potential consequences of delayed appendectomy in cases of acute appendicitis. The findings underscore the pivotal role of pre-operative investigations in shaping surgical outcomes and patient well-being. The male predominance and age distribution observed align with established patterns of acute appendicitis demographics. Importantly, a substantial proportion of cases experienced delays of more than 12 hours due to pre-operative investigations, leading to heightened rates of complications such as perforation, peritonitis, and post-operative infections. The robust contrast in outcomes between the delayed and non-delayed groups underscores the imperative of swift action in managing this surgical emergency.

Our study reinforces the importance of early surgical intervention and accurate diagnosis in mitigating the risks associated with appendectomy. Surgeons and healthcare practitioners are urged to prioritize timely investigative measures and surgical management to minimize complications and optimize patient outcomes. Moving forward, further research is warranted to explore strategies aimed at expediting pre-operative investigations, reducing delays, and ultimately enhancing the quality of care provided to patients with acute appendicitis. Such endeavors will undoubtedly contribute to refining clinical practices and fortifying the foundation of successful appendicitis management protocols.

### Author's Contribution:

Concept & Design of Study:	Saif ur Rahman
Drafting:	Mohammad Usman
Data Analysis:	Anwar Syed
Revisiting Critically:	Saif ur Rahman, Mohammad Usman
Final Approval of version:	Saif ur Rahman

**Conflict of Interest:** The study has no conflict of interest to declare by any author.

## REFERENCES

1. Khan I, ur Rehman A. Application of Alvarado scoring system in diagnosis of acute appendicitis. *J Ayub Med Coll Abbottabad* 2005;17(3).
2. Tan V, Stévignon T, Chaddad M, Dugué L. Appendicitis after right colectomy? How can this be possible? *J Visceral Surg* 2014;151(6):477-8.
3. Yardeni D, Hirschl RB, Drongowski RA, Teitelbaum DH, Geiger JD, Coran AG. Delayed versus immediate surgery in acute appendicitis: do we need to operate during the night? *J Pediatr Surg* 2004;39(3):464-9.
4. Cervellin G, Mora R, Ticinesi A, Meschi T, Comelli I, Catena F, et al. Epidemiology and outcomes of acute abdominal pain in a large urban Emergency Department: retrospective analysis of 5,340 cases. *Annals Translational Med* 2016;4(19).
5. Bhangu A, Søreide K, Di Saverio S, Assarsson JH, Drake FT. Acute appendicitis: modern understanding of pathogenesis, diagnosis, and management. *The Lancet* 2015;386(10000):1278-87.
6. Asad S, Ahmed A, Ahmad S, Ahmed S, Ghaffar S, Khattak IU. Causes of delayed presentation of acute appendicitis and its impact on morbidity and mortality. *J Ayub Med Coll Abbottabad* 2015;27(3):620-3.
7. Khan J, Ali A, Sarwar B. Causes of Delayed presentation of acute appendicitis and how it affects morbidity and mortality. *J Saidu Med College Swat* 2018;8(1).

8. Tan V, Stévignon T, Chaddad M, Dugué L. Appendicitis after right colectomy? How can this be possible? *J Visceral Surg* 2014;151(6):477-8.
9. Muqim R, Khan MI, Khan S. Diagnostic laparoscopy in the management of Post appendectomy pain right iliac fossa. *Isra Med J* 2013;5(1):18-22.
10. Adamu A, Maigatari M, Lawal K, Iliyasu M. Waiting time for emergency abdominal surgery in Zaria, Nigeria. *Afri Health Sciences* 2010;10(1):46.
11. Jalil A, Shah SA, Saaq M, Zubair M, Riaz U, Habib Y. Alvarado scoring system in prediction of acute appendicitis. *J Coll Physicians Surg Pak* 2011;21(12):753-55.
12. Bhangu A. Safety of short, in-hospital delays before surgery for acute appendicitis: multicentre cohort study, systematic review, and meta-analysis. *Annals Surg* 2014;259(5):894-903.
13. Lugo JZ, Avgerinos DV, Lefkowitz AJ, Seigerman ME, Zahir IS, Lo AY, et al. Can interval appendectomy be justified following conservative treatment of perforated acute appendicitis? *J Surgical Res* 2010;164(1):91-4.
14. Nisar AR, Lashari AA, Kumar D, Rasheed T. Delay in Appendicectomy due to Pre-operative Imaging Results in Increased Complication Rate. *Age (years)* 2021;18(25):100.