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The Relationship of Delayed Appendectomy to the Incidence of Surgical Site Infection (SSI) in Acute Appendicitis Patients: a Narrative Review

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Pengantar Redaksi

Salam hangat,

Berjumpa kembali dengan Media Penelitian dan Pengembangan Kesehatan yang hadir dengan delapan artikel untuk Volume 31 No.3 September 2021.

Artikel pertama oleh Nova Sri Hartati dkk. yang berjudul "Pelaksanaan Program Indonesia Sehat dengan Pendekatan Keluarga (PIS-PK) di Puskesmas" menjadi pembuka edisi kali ini. Berdasarkan hasil FGD dengan petugas dan wawancara mendalam kepala puskesmas diketahui bahwa seluruh puskesmas lokus telah melaksanakan persiapan pelaksanaan kunjungan rumah meliputi persiapan SDM, melaksanakan *on the job training* (OJT), mempersiapkan logistik, melakukan sosialisasi eksternal sebelum melakukan kunjungan rumah. Kunjungan rumah yang dilakukan baru bersifat pendataan, belum mengintegrasikan program yang ada di puskesmas

Artikel kedua yang berjudul "Kebahagiaan dan Hubungannya dengan Hipertensi di Indonesia : Analisis Data Indonesian *Family Life Survey* (IFLS5) Tahun 2014" ditulis oleh Olwin Nainggolan, dkk. Kebahagiaan pada beberapa penelitian disebutkan memiliki korelasi dengan beberapa penyakit seperti hipertensi, penyakit kardiovaskular, dan kegemukan. Hasil analisis multivariat artikel ini memperlihatkan kebahagiaan tidak memiliki hubungan yang cukup kuat terhadap kejadian hipertensi (*p value* = 0,62). Variabel umur merupakan faktor yang paling kuat pengaruhnya terhadap kejadian hipertensi dengan OR 5,63 (95%CI 5,02-6,32).

Artikel selanjutnya berjudul "*Gambir (Uncaria gambir Roxb.) as a Potential Alternative Treatment for Hyperlipidemia*" yang dibawakan oleh Nanang Yunarto dkk. Kandungan flavonoid katekin yang tinggi dalam gambir memiliki efek farmakologi dalam pengobatan hiperlipidemia yang berpotensi untuk dikembangkan menjadi obat tradisional. Kajian literatur ini bertujuan untuk mengkaji potensi farmakologi gambir sebagai terapi pengobatan hiperlipidemia berdasarkan hasil studi *in silico*, *in vitro*, *in vivo*, efek farmakologi dan keamanannya, sehingga memberikan bukti informasi ilmiah kepada masyarakat.

Artikel keempat ditulis oleh Dadik Subiyanto dkk. yang berjudul "Subtipe Molekuler Kanker Payudara di RSUD Madiun dan Hubungannya dengan *Grading* Histopatologi". Penelitian ini bertujuan untuk mengetahui distribusi berbagai subtipe molekuler kanker payudara di RSUD Madiun dan juga hubungan antar subtipe molekuler dengan *grading* histopatologi. Artikel ini menyimpulkan terdapat hubungan gambaran imunohistokimia baik ER, PR, HER2, dan Ki67 dengan *grading* histopatologi. ER dan PR positif lebih banyak mengalami diferensiasi baik namun HER2 positif dan Ki67 positif lebih banyak mengalami diferensiasi buruk.

Hasil penelitian di artikel kelima menunjukkan bahwa tidak terdapat hubungan penundaan apendektomi selama kurang dari 48 jam sejak pasien masuk rumah sakit hingga proses pembedahan berlangsung tetapi penundaan apendektomi lebih dari 48 jam menunjukkan adanya hubungan signifikan terhadap kejadian *Surgical Site Infection* (SSI). Artikel dengan judul "*The Relationship of Delayed Appendectomy to the Incidence of Surgical Site Infection (SSI) in Acute Appendicitis Patients: a Narrative Review*", ditulis oleh Wahyuning Ati Ashari dkk.

Artikel yang keenam berjudul "Studi *In Silico* Senyawa Fenolik Madu sebagai Kandidat Inhibitor Mpro SARS-CoV-2" ditulis oleh Pamungkas Rizki Ferdian dkk. Penelitian ini bertujuan untuk menemukan kandidat inhibitor Mpro SARS-CoV-2 dari senyawa fenolik madu menggunakan simulasi penambatan molekuler secara terarah. Hasil penelitian menunjukkan kandidat inhibitor Mpro SARS-CoV-2 terbaik dari senyawa fenolik madu adalah genistein karena memenuhi semua aturan Lipinski, tidak toksik, bukan karsinogen, memiliki energi afinitas -7,6 kKal/mol, kemiripan 80% dengan ligan acuan N3, dan menempati 63,64% area cakupan penambatan.

Artikel ketujuh yang ditulis oleh Maria Lidwina Soetanto dkk berjudul "Faktor-faktor yang Mempengaruhi Praktik Vaksinasi Rabies pada Anjing di Kecamatan Cililin Kabupaten Bandung Barat dengan Pendekatan *Health Belief Model*". Pada penelitian ini, diketahui bahwa praktik vaksinasi rabies oleh pemilik memiliki hubungan yang sangat signifikan dengan pengetahuan terkait rabies sebagai penyakit berbahaya dan keyakinan individu yang ditinjau melalui konsep HBM. Faktor keyakinan individu yang memiliki hubungan signifikan adalah variabel *severity* dan *self efficacy*.

Artikel terakhir berjudul "Pengetahuan, Sikap, dan Praktik Pemilik Kucing yang Berkunjung ke Puskesmas Kota Cimahi Terhadap Kejadian Dermatofitosis pada Kucing Peliharaannya". Hasil penelitian menunjukkan bahwa praktik pemilik kucing mengenai pelepasliaran kucing, praktik membersihkan tempat makan dan minum kucing, dan praktik mencuci tangan sebelum berkontak dengan kucing memiliki hubungan terhadap kejadian dermatofitosis pada kucing peliharaannya, sedangkan variabel lainnya tidak berhubungan. Artikel yang dibawakan oleh Dahlia Yulianti dkk menjadi artikel penutup untuk edisi kali ini.

Akhir kata, Redaksi Media Penelitian dan Pengembangan Kesehatan mengucapkan selamat menikmati sajian kali ini.

Salam Sehat,
Redaksi

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PENGEMBANGAN KESEHATAN****DAFTAR ISI****ARTIKEL**

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The Relationship of Delayed Appendectomy to the Incidence of Surgical Site Infection (SSI) in Acute Appendicitis Patients: a Narrative Review

Hubungan Penundaan Apendektomi dengan Kejadian Surgical Site Infection (SSI) pada Pasien Apendisitis Akut: Tinjauan Naratif

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Abstract

Acute appendicitis is one of the most common causes of surgery worldwide. Appendectomy is a skeptical surgical intervention associated with the risk of Surgical Site Infection (SSI). The purpose of this analysis was to describe the relationship between delayed appendectomy in acute appendicitis and the incidence of SSI. Reviewers selected articles containing data on the incidence of SSI due to appendectomy delays for 3 to 48 hours from seven databases, namely Pubmed, Nature, SpringerLink, Science Direct, ProQuest, Oxford Open Access Journal, and Cochrane Library. The data source was secondary data from international articles published in 2011 to 2020 based on the PICO criteria. The data obtained were then grouped and synthesized without meta-analysis/Synthesis Without Meta-analysis (SWiM) descriptively. A total of 2,778 articles were collected, of which 24 studies met the inclusion criteria. A total of 4 articles showed an association between appendectomy delay and SSI while the other 20 articles did not show a relationship between the two. There was no relationship between appendectomy delays for less than 48 hours since hospital admission to surgery with the incidence of SSI, however a delayed for more than 48 hours showed a significant value. The results showed there was no relationship between delayed appendectomy for less than 48 hours since the time the patient was admitted to the hospital until the surgery took place, but a delayed appendectomy delay for more than 48 hours showed a significant relationship with the incidence of SSI. This narrative review supports early surgical intervention of acute appendicitis cases by considering the severity of the patient to avoid other surgical complications.

Keywords: appendectomy; delay; surgical site infection

Abstrak

Apendisitis akut menjadi salah satu penyebab pembedahan yang paling sering ditemukan di seluruh dunia. Apendektomi merupakan intervensi bedah skeptis yang berhubungan dengan risiko terjadinya

Surgical Site Infection (SSI). Tujuan analisis ini untuk mendapatkan gambaran hubungan antara penundaan apendektomi pada apendisitis akut dengan kejadian SSI. Reviewer memilih artikel yang memuat data kejadian SSI akibat penundaan apendektomi selama 3 sampai 48 jam dari tujuh basis data yaitu Pubmed, Nature, SpringerLink, Science Direct, ProQuest, Oxford Open Access Journal, dan Cochrane Library. Sumber data berupa data sekunder dari artikel internasional yang diterbitkan pada tahun 2011 hingga 2020 berdasarkan kriteria PICO. Data yang didapatkan kemudian dikelompokkan dan disintesis tanpa meta-analisis/Synthesis Without Meta-analysis (SWiM) secara deskriptif. Total artikel yang dikumpulkan adalah 2.778 artikel, sebanyak 24 studi memenuhi kriteria inklusi. Sebanyak 4 artikel menunjukkan hubungan antara keterlambatan apendektomi dengan SSI sedangkan 20 artikel lainnya tidak menunjukkan hubungan keduanya. Tidak ada hubungan penundaan apendektomi kurang dari 48 jam sejak masuk rumah sakit hingga operasi dengan insidensi SSI namun penundaan lebih dari 48 jam menunjukkan nilai yang signifikan. Berdasarkan hasil analisis, disimpulkan bahwa tidak terdapat hubungan penundaan apendektomi selama kurang dari 48 jam sejak pasien masuk rumah sakit hingga proses pembedahan berlangsung tetapi penundaan apendektomi lebih dari 48 jam menunjukkan adanya hubungan signifikan terhadap kejadian SSI. Tinjauan naratif ini mendukung intervensi bedah yang cepat pada kasus apendisitis akut dengan mempertimbangkan tingkat keparahan pasien dan untuk menghindari komplikasi pembedahan lain.

Kata kunci : apendektomi; penundaan; surgical site infection

INTRODUCTION

Appendicitis is an inflammation in the vermiform appendix, a narrow and dead-end with a length of 5-9 cm before the caecum.¹ Acute appendicitis is one of the causes of surgery throughout the world attacking 160/100,000 people in the Middle East till 206/100,000 people in Asia.² The highest incidence of appendicitis occurs in children and young adults, but theoretically, acute appendicitis can occur at any age with a ratio of men and women by 1.4:1.³

Appendectomy is the best management of handling appendicitis. Since the first appendectomy was carried out by McBurney in 1864, the appendix appointment operation was considered a standard of treatment for acute appendicitis. There are two types of appendectomy, namely open and laparoscopic appendectomy. At present, laparoscopic appendectomy is the standard of new care in Western countries.⁴ Apart from the surgery technique carried out, the appendectomy remains a skeptical surgical intervention relating to the risk of the occurrence of the Surgical Site

Infection (SSI). Surgical Site Infection is a postoperative nosocomial infection in the incision area, inner tissue, and organs within 30 days after the surgical procedure. In appendicitis cases, SSI is a serious medical problem that increases the financial burden, health care systems, and patient's individual condition. This infection also affects patients' quality of life.⁵

Teixeira et al. in 2012 has reported that the delay of the appendectomy for more than 6 hours increases the risk of SSI, while Gurien has not found their correlation.^{6,7} This heterogeneity may reflect the limitations of the method and quality of existing research data, as well as the definition variations used to determine the research group. Although extensive research has been conducted, the relationship between delayed appendectomy and the risk of complications of appendicitis, especially SSI is still not convincing. Hence the purpose of this narrative was to describe the relationship between delayed appendectomy and the incidence of SSI in acute appendicitis based on literature with heterogeneous data.

METHODS

Potential relevant articles were comprehensively searched using Cochrane Library, PubMed, Nature, ProQuest, Springer, Science Direct, and Oxford Free Access Journal that studied the Surgical Site Infection among appendectomy patients in ten years (2011 to 2020). A literature research was conducted from December 2020 to January 2021. Article search was done by using Advanced Search, Boolean Operators, and Bibliographic Searching according to keywords combined with MeSH synonyms.

The keywords and its synonym according to MeSH were appendectomy, appendicitis, appendicectomy, early, time, timing, surgical site infection, surgical wound infection, and postoperative wound infection. These keywords were combined using a Boolean operator AND and OR. A flow diagram describing the study selection process is shown in Figure 1.

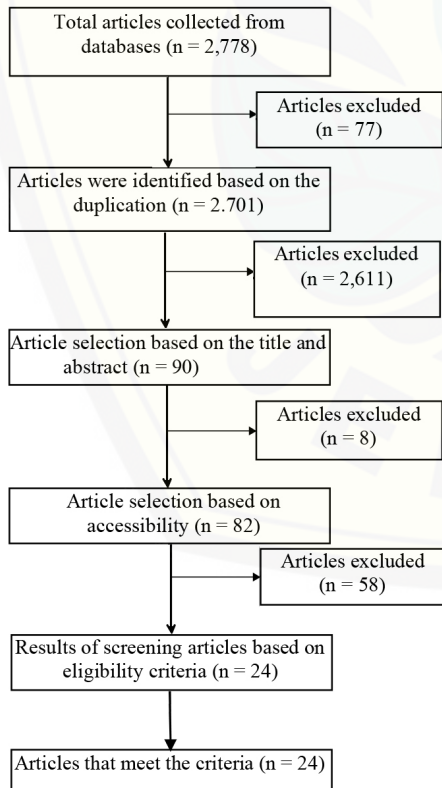


Figure 1. Flow Chart of The Data Selection

This narrative review considered all studies conducted in all countries that reported SSI after delayed appendectomy. Appendectomy delay in this study was defined as the time lag since the patient was admitted to the hospital by appendectomy (intra-hospital delay) within 3-48 hours. The sample in this study was obtained after the entire population was collected through the selection stage. The selection started with the exclusion of the duplicated article, the suitability of the title, abstract, accessibility, and the feasibility criteria that have been determined. Based on the feasibility criteria, we read their titles and abstracts. If studies were relevant for our review, we examined the full texts. Studies of other SSI risk factors and studies on surgical risk factors besides appendectomy were excluded. We reviewed all study types with original data published in the English language. Our literature eligibility criteria were using PICOS (population, intervention, comparison, outcome, and studies).

One reviewer (W.A) independently screened literature titles and abstracts and excluded irrelevant studies. Data from eligible studies were extracted and crosschecked to review the accuracy by the second and the third author (E.S and E.E). We collected literature characteristic data, including research study design, research location, large sample, data retrieval period, and its inclusion criteria. Patient's characteristic data, including age and gender were extracted. Duration of follow-up, time delays (3 to 48 hours) in appendectomy, the incidence of SSI, and the relationship of delaying appendectomy to the incidence of SSI were also extracted. Data synthesis was done without meta-analysis. Data synthesis was done without meta-analysis/Syntnesis Without Meta-analysis (SWiM). Data were analyzed and described descriptively. Researchers draw conclusions based on results obtained from the synthesis and analysis process.

RESULTS

After conducting the research process according to the specified keyword. There were 2,778 articles collected from seven databases. We identified 24 studies that met our inclusion criteria. There were two types of study design, namely 23 articles were cohort-retrospective research and 1 article was cohort-prospective research. The studies in the articles were carried out in 5 different countries. Fourteen (14) studies were conducted in the United States, 6 were held in the Republic of Korea, 2 studies were in Switzerland, 1 was done in Sweden, and 1 was performed in Estonia.

The sample size of each article was different depending on the number of patients of each research location, and the inclusion criteria were specified by each researcher. The characteristic of the studies included is shown in Table 1.

The research conducted in the selected article showed the age and percentage of different sexes. Of the 24 articles, 7 of them were specializing in the children's population, 9 articles had adult patients, 7 articles did not specialize in certain age groups, and 1 article that did not include age demographic data. Based on the percentage of sex, the majority of articles showed that the case of acute appendicitis and more appendectomy occur in male than female patients. There were 23 of 24 articles that had a percentage of male patients more than female patients while article by Fair et al. showed more female patients' percentages than male. Patients' groupings and relationship of appendectomy to SSI incidence are presented in Table 2.

DISCUSSION

There are various risk factors associated with the occurrence of SSI. It depends on factors related to patients (eg. age, comorbid disease) and procedural factors (for example the duration of the operation, type of wound, and use of prophylactic

antibiotics). In appendicitis, other factors have been reported, namely diabetes mellitus, obesity, and nutritional factors. Complex appendicitis, especially the type of gangrene and perforation, is related to the greater risk of SSI.⁸

Based on the selection of articles, 24 articles discussed the relationship between delayed appendectomy since the patient hospital admission with the incidence of Surgical Site Infection (SSI). The durations of the postponement ranged from 3 hours to more than 48 hours, depending on the grouping performed by the previous researchers. A total of 4 articles showed a relationship between delayed appendectomy and the incidence of SSI while 20 other articles did not show any association. The length of follow-up time was mostly 30 days.

Alore et al. (2018), Fair et al. (2015), Teixeira et al. (2012), and Udgiri et al. (2011) have shown the relations of delayed appendectomy with the incidence of SSI while the other 20 articles show no significant relationship. There are several reasons for the delay before the surgical procedure. A study in South Korea states that delays can occur due to various factors, such as patients' treatment time, evaluation time, surgical consultation, pre-existing surgical schedules, and the patient's nil per os (fasting) time.¹⁰ McIsaac et al. cited the reason for the delay, namely the increase in cases that were not accompanied by the number of staff, especially on night shifts and the availability of operating rooms.¹¹ Besides, a delay is also needed to maintain adequate patient resuscitation and reduce surgeon fatigue due to overnight surgery.¹²

Alore et al. (2018) mentioned appendectomy performed at a delay of 3 days had a worse outcome as indicated by an increase in mortality at 30 days, and all postoperative complications than a delay of 1 day and/or two days. After adjustment for confounding variables, it was found that appendectomy delay was not

Table 1. Characteristic of The Selected Articles

Author	Year	Study Design	Location	Sample Size	Data Collection	Inclusion Criteria
Abbas et al. ¹⁴	2016	Cohort Retrospective	USA (Texas)	1.211	1 January 2013 – 31 May 2014	- ≤18 years old - Excludes incidental appendicitis, interval appendicitis, or negative appendicitis
Aiken et al. ¹⁵	2020	Cohort Retrospective	USA (Wisconsin)	1.372	January 2014 – December 2018	- ≥18 years old - Appendectomy performed before 24 hours after admission
Almstrom et al. ¹⁶	2017	Cohort Retrospective	Sweden	2.756	2006 – 2013	- 0 – 15 years old - Appendectomy in suspect appendicitis
Alore et al. ¹³	2018	Cohort Retrospective	USA (Texas)	112.122	2012 – 2015	- Delay ≤4 days - Excludes incidental appendicitis, interval appendicitis, or negative appendicitis
Boomer et al. ¹⁷	2014	Cohort Retrospective	USA (Ohio)	1.388	1 January 2010 – 31 December 2012	- ≤18 years old - Diagnosed appendicitis - Excludes incidental appendicitis, interval appendicitis, or negative appendicitis
Boomer et al. ¹⁸	2016	Cohort Retrospective	USA (Ohio)	1.338	1 January 2010 – 30 June 2012	- ≤18 years old - Diagnosed appendicitis - Excludes incidental appendicitis, interval appendicitis, or negative appendicitis - Listed in The National Surgical Quality Improvement Program for Pediatrics (NSQIP-Pediatrics)
Busch et al. ¹⁹	2011	Cohort Retrospective	Switzerland	1.675	January 2003 – January 2006	- >16 years old - Suspect appendicitis in 6 hospitals
Eko et al. ²⁰	2013	Cohort Retrospective	USA (Massachusetts)	396	1 January 2005 – 31 December 2007	- All patients underwent appendectomy - Excludes incidental appendicitis, interval appendicitis, or negative appendicitis
Fair et al. ²¹	2015	Cohort Retrospective	USA (Illinois)	69.926	2007 – 2012	- Nonperforated appendicitis - Listed in The American College of Surgeons NSQIP (ACS-NSQIP)
Gurien et al. ⁸	2016	Cohort Retrospective	USA (Arkansas)	484	January 2009 – December 2012	- Pediatric surgery patients - Suspect appendicitis and confirmed - Nonperforated appendicitis
Jeon et al. ²²	2016	Cohort retrospective	Republic of Korea	4.148	January 2008 – December 2013	- Suspect appendicitis - Excludes incidental appendicitis, interval appendicitis, or negative appendicitis
Jeon et al. ²³	2018	Cohort Retrospective	Republic of Korea	5.956	January 2008 – December 2016	- Excludes incidental appendicitis, interval appendicitis, or negative appendicitis
Kim H. K. et al. ¹⁰	2016	Cohort Retrospective	Republic of Korea	4.065	January 2010 – December 2014	- Suspect appendicitis - Laparoscopic appendectomy - Excludes incidental appendicitis, interval appendicitis, or negative appendicitis
Kim M. et al. ²⁴	2015	Cohort Retrospective	Republic of Korea	397	October 2013 – August 2014	- Thickened appendix >6 mm in diameter, thickened walls, or peri appendix fat infiltration. Noncomplicated appendicitis
Kim S.H. et al. ²⁵	2015	Cohort Retrospective	Republic of Korea	1.805	January 2007 – February 2012	- Nonperforated appendicitis - Excludes incidental appendicitis, interval appendicitis, or negative appendicitis
Nagpal et al. ²⁶	2012	Cohort retrospective	USA	353	January 2009 – December 2010	- Patients operated in 24 hours after diagnosis - The patient remains at the same health care provider after diagnosis
Saar et al. ²⁷	2016	Cohort prospective	Estonia	266	1 November 2013 – 1 December 2014	- >18 years old - Agree on <i>informed consent</i> - Did not accept previous nonoperating management for the same complain

Author	Year	Study Design	Location	Sample Size	Data Collection	Inclusion Criteria
Saluja et al. ²⁸	2018	Cohort Retrospective	USA (New York)	8.840	2000 – 2013	<ul style="list-style-type: none"> - ≤18 years old - No noncomplicated appendicitis history - Diagnosed with acute appendicitis and generalized peritonitis or with a peritoneal abscess
Sauvain et al. ²⁹	2016	Cohort retrospective	Switzerland	2.559	12 February 2007 – 28 March 2011	<ul style="list-style-type: none"> - Suspect appendicitis in 6 hospitals in Zurich region - >16 years old
Serres et al. ⁹	2017	Cohort Retrospective	USA (Massachusetts)	2.429	1 January 2013 – 31 December 2014	<ul style="list-style-type: none"> - ≤18 years old - Appendectomy in 24 hours after admission - Listed in NSQIP-Pediatric
Seudeal et al. ³⁰	2018	Cohort retrospective	USA	116	March 2015 – March 2016	<ul style="list-style-type: none"> - 18 – 90 years old - Diagnosed with appendicitis - Non pregnant - Initial examination and appendectomy were performed at the same hospital
Shin et al. ³¹	2014	Cohort retrospective	Republic of Korea	333	1 January 2011 – 31 December 2011	<ul style="list-style-type: none"> - 16 – 65 years old - Not in a state of pregnancy or in intensive care - Diagnosis of appendicitis
Taixiera et al. ⁷	2012	Cohort Retrospective	USA (California)	4.108	June 2003 – June 2011	<ul style="list-style-type: none"> - All patients underwent an appendectomy
Udgiri et al. ³²	2011	Cohort retrospective	USA	201	2009	<ul style="list-style-type: none"> - Excludes incidental appendicitis, interval appendicitis, or negative appendicitis

Table 2. Articles Review of the Appendectomy and SSI Relationship

Author, Year	Patient Groupings	Appendectomy-SSI	
		Related	Not Related
Abbas et al., 2016	Patients were divided into two groups, namely patients with postoperative complications and patients without complications.		√
Aiken et al., 2020	Patients were divided into two groups, namely the group that was operated on in 12 hours and >12 hours.		√
Almstrom et al., 2017	Patients were divided into 4 groups, namely groups with interval from admission to appendectomy for 0-12 hours, 12-24 hours, 24-36 hours, and > 36 hours.		√
Alore et al., 2018	Patients were divided into 3 groups, namely the group with interval of admission to surgery in 1 day (HD1), 2 days (HD 2), 3 days (HD3).	√	
Boomer et al., 2014	Patients were divided into 5 groups between admission and appendectomy, namely <3 hours, 3-6 hours, 6-9 hours, 9-12 hours, and >12 hours group.		√
Boomer et al., 2016	Patients were divided into 5 groups between admission and different appendectomy, namely <3 hours, 3-6 hours, 6-9 hours, 9-12 hours, and >12 hours groups.		√
Busch et al., 2011	Patients were divided into two groups, the time between admission and appendectomy was different, namely the group ≤12 hours and >12 hours.		√
Eko et al., 2013	Patients were grouped into 4 groups of operative time, namely ≤6 hours, 6-12 hours, 12-18 hours, and >18 hours.		√
Fair et al., 2015	Patients were divided into 3 groups, namely Group 1 with a delay of <24 hours, Group 2 24-48 hours, and Group 3 >48 hours.	√	
Gurien et al., 2016	Patients were grouped into 2 groups of time from admission to the patient entering the operating room, namely the group <6 hours and >6 hours.		√
Jeon et al., 2016	Delays were grouped into 4 groups, namely the group ≤6 hours, 6-12 hours, 12-18 hours, and >18 hours.		√
Jeon et al., 2018	Delays were grouped into 2 groups, namely groups ≤12 hours and >12 hours.		√
Kim H.K. et al., 2016	Kim S.H. et al., 2015		
Patients were divided	into 4 groups, namely Group A with a delay of 0-6 hours, Group B 6-12 hours, Group C 12-18 hours, and Group D >18 hours.		√
ed	Patients were divided into two groups of time lag from admission to hospital and appendectomy, namely the Immediate group at 12 hours and the delay of 12-24 hours.		√
Kim M. et al., 2016	Patients were grouped into 2 groups of delay, namely <6 hours and 6-24 hours.		√

Author, Year	Patient Groupings	Appendectomy-SSI	
		Related	Not Related
Nagpal et al., 2012	The time lag between the surgical decision and incision was ≤ 6 hours (Early) and > 6 hours (Late).		√
Saar et al., 2016	Patients were stratified according to surgical relief of abdominal pain. There are 4 groups, namely 0-12 hours, 13-24 hours, 25-36 hours, 37-48 hours, and > 48 hours.		√
Saluja et al., 2018	Patients were grouped into 2 groups, namely the group with a gap in admission time with surgery of 2 days (Early) and more than 2 days (Late).		√
Sauvain et al., 2016	Patients were divided into 2 groups, namely surgical interval < 360 minutes and ≥ 360 minutes.		√
Serres et al., 2017	Patients were grouped into 2 groups, namely Early and Late based on the time lag from admission to the ER with appendectomy based on the median time delay.		√
Seudeal et al., 2018	Patients were divided into 2 groups, namely the time lag to intervention within 8 hours (Group 1) and after 8 hours (Group 2).		√
Shin et al., 2014	Patients were grouped into 2 groups, namely Group A with a time lag of ≤ 8 hours from arrival at the hospital by incision and Group B > 8 hours.		√
Taixiera et al., 2012	Patients were divided into 2 groups, namely < 6 hours and > 6 hours.	√	
Udgiri et al., 2011	The time lag between incision and arrival at the ER was less than 10 hours (Group A) and more than 10 hours (Group B) after arriving at the ER.	√	

a significant predictor of major complications, but rather the type of procedure and ASA-PS grade.¹³ Fair et al. (2015) showed there is a significant relations between the delay of 24, 48, and > 48 hours with wound infection. After adjusting for confounding variables, the risk was attenuated, but it still increased for the group that experienced a delay of > 48 hours, whereas there was still no increased risk for a delay of 2 days compared to 1 day.²¹ Udgiri et al. (2011) demonstrated that patient delay > 10 hours had a significant association with an increase in SSI but not significant for superficial SSI. Besides that, the delay also shows a significant relationship with the length of stay.²⁶

Aiken et al. (2020) showed no significant difference between delayed cases of > 12 hours and non delayed cases for surgery time (within 12 hours), intraoperative findings, rates of perforation, or postoperative complications including SSI. However, despite being declared safe, delayed appendectomy was associated with increased length of stay and increased total hospital costs compared to appendectomy within 12 hours of reaching the emergency room.¹⁵

Likewise, the results are shown by Almstorm et al. (2017) and Boomer et al. (2016, 2018). Six studies conducted in the Republic of Korea showed no association with delayed appendectomy with SSI.^{10,22-26} But the delay has an impact on the length of stay and other postoperative complications such as ileus. The six studies show that a delay of 24 hours is still relatively safe. These results are consistent with Gurien et al. (2016) that there was no statistical significance indicating SSI or perforation was associated with delayed appendectomy, but white blood count at admission was significant with perforation.⁷

Based on a review conducted by reviewers from 24 articles discussing the relationship between delayed appendectomy and SSI, it is known that the delayed in appendectomy since the patient was admitted to the hospital until the surgical process took place was not associated with an increased risk of SSI if the delay was less than 48 hours. Nonetheless, this narrative review supports prompt surgical intervention of acute appendicitis cases considering the severity of the patient.

CONCLUSION

A delayed appendectomy since the surgery admission time does not show any significant correlations to the incidence of SSI. Appendectomy should be done immediately to reduce other postoperative complications by considering the severity of acute appendicitis.

SUGGESTIONS

The decision of surgery schedule and postponement of the appendectomy should be under the consideration of the severity of the patient condition through a review of the clinical condition and the results of investigations.

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