

2021-09

Operative Management Outcomes of Acute Appendicitis and Associated Factors Among Patients Operated For Acute Appendicitis in Felege Hiwot Comprhensive Specialized Hospital, Amhara National Regional State, Northwest, Ethiopia

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BAHIRDAR UNIVERSITY
COLLEGE OF MEDICINE AND HEALTH SCIENCES,
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OBSTETRICS

OPERATIVE MANAGEMENT OUTCOMES OF ACUTE APPENDICITIS
AND ASSOCIATED FACTORS AMONG PATIENTS OPERATED FOR
ACUTE APPENDICITIS IN FELEGE HIWOT COMPREHENSIVE
SPECIALIZED HOSPITAL, AMHARA NATIONAL REGIONAL STATE,
NORTHWEST, ETHIOPIA

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SEPT, 2021
BAHIRDAR

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ARESEARCH THESIS SUBMITTED TO COLLEGE OF MEDICINE AND
HEALTH SCIENCES, SCHOOL OF MEDICINE, BAHIR DAR UNIVERSITY,
IN PARTIAL FULFILMENT OF REQUIREMENTS FOR DEGREE OF
MASTER OF SCIENCE IN INTEGRATED EMERGENCY SURGERY AND
OBSTETRIC AND GYNACOLOGY

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Full title of thesis	Operative management outcomes of acute appendicitis and associated factors among patients operated for acute appendicitis in Felege Hiwot comprehensive specialized hospital, Amhara national regional state, Ethiopia
Duration of the study	March 1-30 /2021
Study area	Felege Hiwot comprehensive specialized hospital

DECLARATION

This is to certify that the thesis entitled “operative management outcomes of acute appendicitis and associated factors among patients operated for acute appendicitis in Felege Hiwot Comprehensive specialized Hospital”, submitted in partial fulfillment of the requirements for the Master of science in Integrated Emergency Surgery and Obstetrics and Gynecology in Department of School of Medicine, Bahir Dar University, is a record of original work carried out by me and has never been submitted to this or any other institution to get any other degree or certificates. The assistance and help I received during the course of this investigation have been duly acknowledged.

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Date

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APPROVAL OF THESIS FOR DEFENSE

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APPROVAL OF DISSERTATION/THESIS FOR DEFENSE RESULT

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ACKNOWLEDGEMENTS

I am grateful to Bahir Dar University, College of Medicine & Health Sciences Department of Integrated Emergency Surgery and Obstetrics for selecting research topic and assigning advisor. My exceptional gratitude goes to my advisor’s Dr Tafere Guadie (MD, Assistant Professor of General surgery) and Mr. Ababayehu Bitew (Assistant Professor, Head, Department of Epidemiology and Biostatics School of Public Health, College of Medicine and Health Sciences) who have given a great help to the completion of this thesis starting from commenting the draft of my proposal and giving very important suggestion.

ABBREVIATION'S /ACRONYMS

AOR	Adjusted Odds Ratio
ARHB	Amhara Regional Health Bureau
BSC	Bachelor of Science
BUCMHS	Bahir Dar University College of Medicine and Health
CMHS	Science Collage of Medicine and Health Science
FHCSH	Felege Hiwot Comprehensive Specialized Hospital
IESO	Integrated Emergence Surgery and Obstetrics.
IgA	Immunoglobulin A
MPH	Master of Public Health
PI	Principal Investigator
RB	Responsible Body
RIF	Right Iliac Fossa
RLQ	Right Lower Quadrant
SPSS	Statistical Package of Social Science
TASH	Tikur Anbessa Specialized Hospital
WBCs	White Blood Cells

Table of Contents

Declaration.....	iii
Approval of Thesis for defense.....	iv
Approval of Dissertation/thesis for defense result.....	v
ACKNOWLEDGEMENTS.....	vi
ABBREVIATION'S /ACRONYMS.....	viii
LIST OF TABLES.....	xi
LIST OF FIGURES.....	xii
ABSTRACT.....	xiii
1.INTRODUCTION.....	1
1.1 Background.....	1
1.2. Statement of the problem.....	2
1.3 Significance of the study.....	4
2 LITERATURE REVIEW.....	5
2.1 Socio demographic characteristics.....	5
2.2. Operative management outcomes of acute appendicitis.....	6
2.3 Disease related factors.....	7
2.3.1 Clinical signs and symptoms and Intra-operative findings.....	7
2.3.2 Duration of Illness and length of hospital stay.....	9
2.4 Treatment Related Factors:.....	10
2.4.1 Duration of surgery, Type of procedure and Type of abdominal incision.....	10
3. OBJECTIVES.....	12
3.1. General objective.....	12
3.2. Specific objectives.....	12
4. METHODS.....	13
4.1. Study design and study period.....	13
4.2. Study area.....	13
4.3. Population.....	13
4.3.1. Source population.....	13
4.3.2. Study population.....	13
4.3.3. Eligibility criteria.....	13
4.4. Sample size determination and sampling technique.....	14

4.4.1. Sample size determination	14
4.4.2. Sampling technique.....	15
4.5. Data collection and procedure.....	15
4.6. Data quality control.....	15
4.7. Study variables.....	16
4.7.1. Dependent variables	16
4.7.2. Independent variables	16
4.8. Operational definition	17
4.9. Data processing, analysis and interpretation.....	18
4.10. Ethical consideration.....	19
4.11. Dissemination of results.....	19
5. Results.....	20
5.1 Sociodemographic characteristics.....	20
5.2 Clinical symptom, sign and investigation profile of patients with appendicitis	21
5.2.1 Clinical symptoms	21
5.2.2 Clinical signs.....	21
5.2.3 Investigation profiles	21
5.3 Management procedures for acute appendicitis.....	25
5.4 Factors affecting treatment outcomes of acute appendicitis	30
6 Discussion.....	33
7 Conclusions and Recommendations	34
7.1 Conclusions.....	34
7.2 Recommendations.....	35
REFERENCES	36
ANNEXIS	39

LIST OF TABLES

TABLE 1: SAMPLE SIZE DETERMINATION FOR ASSOCIATED FACTORS FOR OPERATIVE TREATMENT OUTCOMES OF ACUTE APPENDICITIS IN FHCSH, NORTHWEST, ETHIOPIA, 2021	14
TABLE 2 SOCIODEMOGRAPHIC CHARACTERISTICS OF PATIENTS OPERATED FOR A CLINICAL DIAGNOSIS OF ACUTE APPENDICITIS FROM SEPTEMBER 1 2018 TO 2020 (N=300).....	20
TABLE 3 CLINICAL SYMPTOMS OF PATIENTS OPERATED FOR ACUTE APPENDICITIS IN FHCSRH FROM 1/2018-1/2020	22
TABLE 4 CLINICAL SIGN AND LABORATORY INVESTIGATIONS OF OPERATED PATIENTS FOR ACUTE APPENDICITIS IN FHCSRH FROM 1/2018-1/2020	23
TABLE 5 MANAGEMENT RELATED PROFILES OF PATIENTS OPERATED FOR A CLINICAL DIAGNOSIS OF ACUTE APPENDICITIS FROM 2018 TO 2010 (N=300).....	26
TABLE 6 FACTORS AFFECTING TREATMENT OUTCOME OF ACUTE APPENDICITIS FROM 2018 TO 2020(N=300)..	31
TABLE 7 FACTORS AFFECTING TREATMENT OUTCOME OF ACUTE APPENDICITIS FROM 2018 TO 2020(N=300)..	32

LIST OF FIGURES

FIGURE 1: CONCEPTUAL FRAME WORK SHOW FACTORS ASSOCIATED WITH MANAGEMENT OUTCOMES OF ACUTE APPENDICITIS DEVELOPED BY REVIEWING DIFFERENT LITERATURES (DAGEBO ET AL., AFENIGUS ET AL., 2019, JANGALE ET AL., 2014, JAMES, 2017, IAMARINO ET AL., 2017).....	11
FIGURE 2 ; DURATION OF ILLNESS PRIOR TO ADMISSION OF ACUTE APPENDICITIS PATIENTS AT FHCSH FROM SEPTEMBER 2018-2020	24
FIGURE 3: INTRA OPERATIVE FINDING OF PATIENTS OPERATED FOR ACUTE APPENDICITIS IN FHCSH FROM SEPTEMBER 2018-2020	28
FIGURE 4: POST-OPERATIVE COMPLICATION OF ACUTE APPENDICITIS PATIENTS AT FHCSH FROM SEPTEMBER 2018- SEPTEMBER 2020	29

ABSTRACT

Background: Acute appendicitis is a condition characterized by inflammation of the vermiform appendix. If untreated, mortality is high, mainly because of rupture leading to peritonitis and shock. There is limited evidence about operative management outcomes of acute appendicitis and associated factors.

Objective: The objective of the study is to assess the operative management outcomes of acute appendicitis and associated factors among patients operated for acute appendicitis in Felege Hiwot Comprehensive Specialized Hospital.

Methods: Institutional based cross-sectional study design was undertaken for patients who were managed surgically. Data were collected from surgical registration books and patient's medical card. Systematic sampling technique was employed to select charts for review. The collected data was checked for its completeness, entered, edited and cleaned using EPIinfo version 7 and analyzed by Statistical Package of Social Science version 25.0. Logistic regression analysis was employed.

Results: Among 300 patients operated with a diagnosis of acute appendicitis with its complication 51 (17%) developed unfavorable treatment outcomes. Patients who had perforated appendicitis (adjusted odds ratio= 5.3; 95% confidence interval (2.07, 13.51)), intraoperative appendiceal mass (adjusted odds ratio = 6.7; 95% confidence interval (1.78, 25.18)) and generalized abdominal tenderness (adjusted odds ratio = 3.7; 95% confidence interval (1.64, 8.38)) were significantly associated with an unfavorable appendicitis treatment outcome.

Conclusion and recommendation: Nearly one-sixth of the patients developed unfavorable treatment outcomes. Perforated appendicitis, intraoperative appendiceal mass and generalized abdominal tenderness were significantly associated with unfavorable appendicitis treatment outcome. Therefore, for health professional's early detection and treatment of acute appendicitis is crucial for a better outcome.

Keywords: Appendicitis; Appendectomy; Operative outcomes

1.INTRODUCTION

1.1 Background

Appendicitis is defined as inflammation of the vermiform appendix. Unfavorable outcome is defined as patients with a clinical diagnosis of acute appendicitis who improved but developed one or more postoperative complication(s), e.g., wound infection, intestinal obstruction, or patients with a clinical diagnosis of acute appendicitis who have died in the intra- or post-operative period (1-3).

Appendicitis in late adulthood is characterized by a delay in treatment, high perforation rates, and unfavorable outcome parameters, all mutually correlating (4). Complicated appendicitis and a non-satisfactory outcome in children after operation are associated with a long preoperative duration of symptoms, young age and long surgical time (5).

The morbidity of immediate operative treatment was 36.5% for complicated appendicitis (6).The wound infection rate and the incidence of intra-abdominal abscess after the treatment of perforated appendicitis in children is higher than that of non-perforated appendicitis (7).

The rate perforation is higher in the elderly than the general population (8). As a result of increased comorbidities and an increased rate of perforation, postoperative morbidity, mortality, and hospital length of stay are increased in the elderly compared with younger populations with appendicitis. And very young children had the greatest risk of complicated disease (9, 10).

The current standard of care for patients with appendicitis is the surgical appendectomy (3, 11). Increase in the timing of surgery from the onset of symptoms is associated with higher risk of complicated appendicitis and postoperative complications (12).

Appendectomy for presumed appendicitis is the most common surgical emergency during pregnancy. The incidence is approximately 1 in 766 births. Acute appendicitis can occur at any time during pregnancy but is rare in the third trimester. The overall incidence of fetal loss after appendectomy is 4%, and the risk of early delivery is 7%. Rates of fetal loss are considerably higher in women with complicated appendicitis than in those with a negative appendectomy or with simple appendicitis (13, 14).

1.2. Statement of the problem

Acute appendicitis is the commonest surgical emergency (3, 15, 16). It is a challenging task for the surgeons worldwide. The perforated appendix and its complications are associated with significant morbidity and even mortality in the developing world like Pakistan. Poverty, misdiagnosis because of variability in symptomatology, late clinical presentation, elderly age and lack of modern diagnostic aids with expertise in the Emergency Departments are the major factors responsible for the advanced disease profile and its complications. Acute appendicitis is the most common causes of acute abdomen which accounts 57.6%. Acute appendicitis is a condition that requires an immediate decision and intervention. The difficulty in distinguishing appendicitis from other common causes of abdominal pain, and the increase in morbidity and mortality accompanying perforation makes appendicitis an important disease entity (17).

The incidence of appendicitis in Northern America is 100 per 100,000 person-years with nearly 400,000 diagnoses in 2015. In contrast, incidence is increasing in Asia, the Middle East, Southern America, and Africa (18).

Post-appendectomy mortality rate was 2.1/1000. Increased mortality was found in patients over 60 years of age. Negative appendectomy and complicated appendicitis were associated to mortality. Surgical site infection was observed in 13% and pelvic abscess in 2% of the patients (19, 20).

The major causes of morbidity and mortality in acute appendicitis are perforation and gangrene. perforation rate was correlated mostly with the pre-hospital and the in-hospital delay 86% and 14% respectively (21, 22). Similarly studies showed that increase in the timing of surgery from the onset of symptoms is associated with higher risk of complicated appendicitis and postoperative complications (12, 23, 24). In contrary study done in 2016 showed that lengths of hospital stay were not significantly associated with the risk of perforation but, complicated appendicitis was 3.46 more likely to develop unfavorable outcome than simple appendicitis (25-27).

A study done in Veterans Affairs Medical Centers showed that 16% of patients had one or more complications after surgery (28).

However, Study done in Africa showed that appendicitis remains a significant health challenge in Africa due to the attendant high incidence of perforations and complications (29). Retrospective study showed that from patients from acute appendicitis 28.5% had appendiceal perforation. The peak age was in the second and third decades of life with male predominance. The most common complications were Surgical site infections, wound dehiscence and pelvic abscess, 18.6%, 15.2%, 13.5% respectively (30). Severe forms of acute appendicitis and post-operative morbidity are higher in the elderly population which accounts 39.2% (31).

Retrospective cohort study done to identify clinical factors predictive of appendicitis in pregnant women and associated obstetric outcomes showed that women with appendicitis had a higher rate of pregnancy loss <20 week (32). In the study done in South Africa and USA showed that patients from more rural environments demonstrate poorer outcomes (33).

Study done in Ethiopia, Mizan Aman Hospital, showed that 31.9% of them had unfavorable outcome. Postoperative wound infection was the predominant postoperative complication in 66% of patients and paralytic ileus was found in 12%, Pneumonia in 11%, peritonitis in 6% and fecal fistula 2% of patients (1). Study done in Saint Luke catholic hospital, wolliso, 10.2% of them had unfavorable outcome (34). Study done in Amhara region showed that 26.6% of them developed unfavorable treatment outcomes

There is greater variation in operative management outcomes of acute appendicitis among studies done in different areas of Ethiopia like, Saint Luke Catholic Hospital, Oromia Region (10.2%), Nekemit (29.3%), Mizan Aman (31.9%), Debre Markos, Amhara Region (26.6%) (1, 34-36). Therefore, the present study was clearly show operative management outcomes of acute appendicitis.

In addition to these even though there are studies have been conducted to assess the operative management outcomes of acute appendicitis in Ethiopia, only limited studies assess the associated factors of operative outcomes of acute appendicitis.

Study done in Gimma University, Mizan Aman General Hospital showed that; those who cannot read and write, with fever, perforated appendix, post-operative length of hospital

stays, who had right lower quadrat mass had more likely to have unfavorable management outcomes (1). However, study done in Oromia, Wolliso, showed that only those who had elevated WBC count were more likely to have unfavorable outcomes (34) Study conducted in Amhara region, showed that elevated WBC count and intraoperative appendiceal abscess were more likely to have unfavorable treatment outcomes (36). This study will narrow these gaps.

In this study comorbid illness, prophylactic antibiotics, duration of surgery, type of anesthesia, position of the appendix, post-operative analgesia added as a variable which is not included in the studies done in Nekemit and Debre Markos (35, 36). As far as to my review no similar studies were documented in the study area, this shows that knowing relevant factors for operative management outcomes of acute appendicitis may be used for stakeholders, policy makers to improve developed strategies by using the finding of this study.

Therefore, this study aimed to assess operative management outcomes and associated factors of acute appendicitis at FHCSH.

1.3 Significance of the study

The significance of this study is to assess and show the effect of the disease for those who are responsible directly or indirectly in giving health care service and also to contribute practicable recommendations based on the study findings, so that proper planning, implementation and evaluation of the perspective health activities will be conducted in the study area. The findings of this study would help to have additional and recent information on the problem and provide some knowledge and insight on operative management outcomes and associated factors of acute appendicitis in FHCSH, Amhara region. In addition, the finding of this study will be used as a guide for the governmental, nongovernmental organization and the local health workers as addition information to provide quality health care service, early diagnosis and treatment, for those patients with acute appendicitis. It will also use as aspiring for those who need to conduct similar study on the issue which is not addressed in this study in the region and FHCSH.

2 LITERATURE REVIEW

2.1 Socio demographic characteristics

Worldwide studies showed that a total of 78% of children with age less than 6 years and 44% of children age greater than 10 years had a non-satisfactory outcome (5).

The study conducted by Addis and associates nearly 70% of patients with acute appendicitis are less than 30 years of age. In addition the study illustrated that acute appendicitis is slightly more common in males, with a male: female ratio of 1.4:1. In a lifetime, 8.6% of males and 6.7% of females can be expected to develop acute appendicitis (15, 37)

The American Academy of Pediatrics released a study done on acute appendicitis risk of complications. Accordingly, appendicitis was more common in boys of all ages with annual incidence greatest for boys 10 to 14 years and girls 15 to 16 years old (10).

A retrospective population-based cohort study conducted in Canada showed that, 58% of the patients were male, 35.5% had perforation. The incidence was highest in those aged 10–19 years. The female: male age-adjusted ratio was 1:1.4 (38). In study done on outcomes of operative management of appendicitis, the average age was significantly greater for patients with complicated versus uncomplicated appendicitis (47 vs. 33 years, respectively), and by logistic regression, age was a significant factor for complicated appendicitis (39).

A study conducted by Bech-Larsen showed that total of 78% of children < 6 years and 44% of children > 10 years had a non-satisfactory outcome (5, 40).

Study conducted in Taiwan showed that age 1.05 and male sex 1.96 more likely had appendiceal rupture (8).

Prospective case series study done to evaluate the major factors affecting the clinical outcome in the management of acute appendicitis showed that age ranged from 13-65

years and 57% of the patients were male (20). Contrarily, study done on epidemiologic Features of Acute Appendicitis in A Tropical African population there has been an increasing incidence in both sexes almost in a similar pattern. The highest incidence in males and females occurred in the second and third decades, respectively (41).

In a study carried out at Zewditu Memorial Hospital, showed that a male to female ratio of 2.6: 1. The patients' ages ranged between 13 and 75 with the peak occurring between 13-30 years (42). Equivalent study was carried out at Tikur Anbessa Teaching Hospital where acute appendicitis accounted for just over half of the acute abdomen cases 52 %, of whom 67% were males and 34% were females (M: F =2:1). The majority of the cases were in their second and third decades of life. Four patients (3.3%) with acute appendicitis had died (43).

A study done in Ethiopia in Saint Luke Catholic Hospital Oromia region, male patients with a clinical diagnosis of acute appendicitis were 63% less likely, risk of developing unfavorable outcome as compared to their female counterparty (34). Whereas study done in Nekemit Referral Hospital showed that, not only being male but also age less than 30 year, being married, being Oromo were 20.246, 0.411, 5.27 times more likely to develop bad management outcomes respectively (35). In another study done in Debre Markos being male is more likely to develop acute appendicitis than female, with the commonest age group of less than or equal to 20 years (36).

2.2. Operative management outcomes of acute appendicitis

In study done in Worldwide on outcomes of operative management of appendicitis, the overall rate of complicated appendicitis was 13% (39).

A Cross-Sectional study done in Rajshahi medical college hospital showed that post-operative complications occurred 80% of cases. Post-operative complications were monitored and addressed as: prolonged ileus, wound sepsis as major and minor wound infection, intra-abdominal sepsis as pelvic abscess and fecal fistula (22). But cross-sectional study done in India showed that post-operative complications were noted in 51% of the patients, commonly paralytic ileus (46%) and wound infection (20%) (44).

Study conducted by Bech-Larsen showed that 73% of patients with a non-satisfactory outcome had complicated appendicitis (5).

Study done by Samuel Chidi Ekpemo in Aba, Nigeria showed that those with postoperative outcome with wound infection recorded in 20%, wound break down 10%, septicemia 15%, pelvic abscess 5% and death 1% (45). Study conducted in Sudan showed that complications were seen in 16.5% and no mortality was reported in this study. Surgical site infection accounts 9.7% (46).

Study done in Zewditu Memorial Hospital showed that following appendectomy, the postoperative mortality rate was 1.2% (42).

According to the study done in Saint Luke Catholic Hospital, Oromia Region, 39 (10.2%) of them had negative outcome where they have improved but developed one or more postoperative complication(s). Postoperative wound infection was the predominant postoperative complication 48.7% patients and bowel adhesion was found 26% (34). Whereas study done in Nekemit Referral Hospital showed that 29.3% have developed bad outcome where they have improved but develop one or more complication (35).

A study done in Debre Markos hospital showed that among 169 patients who underwent appendectomy for treatment of acute appendicitis, 45(26.6%) of them developed unfavorable treatment outcomes (36).

2.3 Disease related factors

2.3.1 Clinical signs and symptoms and Intra-operative findings

The American Academy of Pediatrics study showed that 24% of children with the disease had gross perforation, while 8% had acute appendicitis complicated by peritoneal abscess. Young children had the lowest incidence of acute appendicitis, but they had a 5 times risk of complicated disease than those with 15 - 16-year-old. Children, 5 years old had 46% risk of gross perforation and 19% had abscess formation, compared with 19% and 16% than the above age (10).

Study done in India showed that all the patients had typical right iliac fossa pain, with tenderness and localized guarding in 37%. Ultrasound diagnosed appendicitis in 80% of cases. Leukocytosis was seen in 71% with neutrophil shift in 85% of patients. 60% of patients had perforation and abscess formation, gangrene in 45% and mass in 37% (44).

Study conducted in Taiwan showed that fever >38 degree centigrade 2.59, left shift in leucocyte counts greater than seventy-six present 2.34, anorexia 2.03, and a retrocecal positioned appendix 1.93 more likely had appendiceal rupture (8).

Study done in Africa showed that patients had different intraoperative findings like appendix abscess 10%, appendix mass 15%, perforated appendix 30%, gangrenous appendix 5% (45).

A retrospective study conducted at South Africa showed that 56% was from the urban area. 60% of appendices were perforated and associated with intra-abdominal contamination with 40% risk of re operation (47).

A case-control study done in 402 patients with acute appendicitis showed that 45% of the patients with appendiceal perforation had post-operative complication (48).

Study carried out at Zewditu Memorial Hospital, showed that the natural course of the disease comprised 70.6% simple appendicitis, 17.4% perforated appendix, 9.5% gangrenous appendix, and 2.5% appendiceal abscess with amputated stump left (42).

A study done in Ethiopia, Oromia Region, showed that patients with $WBC > 10,000$ cells/mm³ with clinical diagnosis of acute appendicitis were 3.6 times more likely have unfavorable outcome as compared to their counterparts (34).

Study done in Nekemet Referral Hospital. All the cases presented with abdominal pain and a shift of peri-umbilical pain to the right lower quadrant. The commonest sign was right lower quadrant tenderness. The rate of simple and perforated appendicitis was 65.2% and 21.5%, respectively. Patients who develop post operative wound infection were 19.9%. There was no death encountered (35).

Study conducted at Attat General Hospital, Gurage Zone Abdominal pain (100%), vomiting (79%) and nausea (81%) were the main complaints of appendicitis. Half of

patients had body temperature of ≥ 37.5 c 41 (50%) and the rest < 37.5 °C. Acute appendicitis (simple) contributes 85.4% and high in 2nd decade, appendiceal abscess (6.1%) and perforated appendicitis accounts 8.5%. The most post op complication in this study was surgical site infection which was 8.5%. one death following appendectomy plus abscess drainage. The complication was within 5th and 6th decades and who comes after two days of illness (49).

Similarly, Retrospective study done at MizanAman General Hospital in 182cases showed that all presented with abdominal pain, 58.2% had right lower quadrant tenderness. The rate of perforated appendix was 40 (22%).The commonest post-operative complication was wound infection 66% (1, 35, 44).

A study done in Debre Markos showed that two variables were statistically associated with the treatment outcomes of acute appendicitis. These were elevated WBC count at the time of presentation and intraoperative appendiceal abscess. Patients who had elevated WBC count at the time of presentation were 4.7 times more likely to develop unfavorable treatment outcome. Those who had an intraoperative appendiceal abscess were 3.8 times more likely to develop unfavorable treatment outcome as compared to their counterparts(36).

2.3.2 Duration of Illness and length of hospital stay

A study conducted in America showed that there was two times risk of complication in patients with delayed presentation more than 48hrs (12, 24, 50, 51). Similarly, In Tomisoara, Romania, it was found that high morbidity and mortality rates from acute appendicitis were due to delay that led to higher incidence of perforation (52). The hospital length of stay was 2.3 times longer for patients with complicated appendicitis (4.4 vs. 1.9 days) (39).

Study done in Pakistan showed that patients with perforated appendicitis had a significant pre hospital interval (2.67 times longer) in contrast to patients having appendicitis without perforation (50).

Study conducted in Taiwan showed that preadmission duration of pain and interval of time from admission to surgery had risk of appendiceal rupture by 1.23 and 1.02 times respectively (8).

In a study conducted in South Africa, all of the patients who died during post appendectomy period (1.2% mortality rate), were presented more than four days after the onset of symptoms (53).

Cross-sectional study done in Rajshahi medical college hospital showed from the risk factors studied, the patient's pre-hospital time delay was the most important risk factor for perforation 86% (22). In contrary in another study delayed operation was associated with significantly fewer overall complications, wound infections, abdominal/pelvic abscesses, ileus/bowel obstructions, and reoperations (16, 54, 55).

However study done in Ethiopia, Nekemit Referral Hospital showed that, duration of presentation to hospital after illness >24hrs and duration of hospital stay > 7 days were significantly associated with the bad management outcomes by, 0.342, 5.072, times respectively (35).

2.4 Treatment Related Factors:

2.4.1 Duration of surgery, Type of procedure and Type of abdominal incision

Worldwide retrospective study showed that surgical time was significantly shorter in the group of patients with a satisfactory outcome and in those with simple appendicitis than in the other groups (5).

Prospective study conducted in Sudan showed that the approach to appendectomy was through Grid Iron incision in 88.3% patients, through Lanz incision in 9.5% patients and through Lower right paramedian incision in 1.5% patients. All patients who underwent surgical interventions received prophylactic antibiotics in the form of Ceftriaxone 1gram+ Metronidazole 500 mg intra-venously at induction of anesthesia (56).

2.4 Conceptual framework

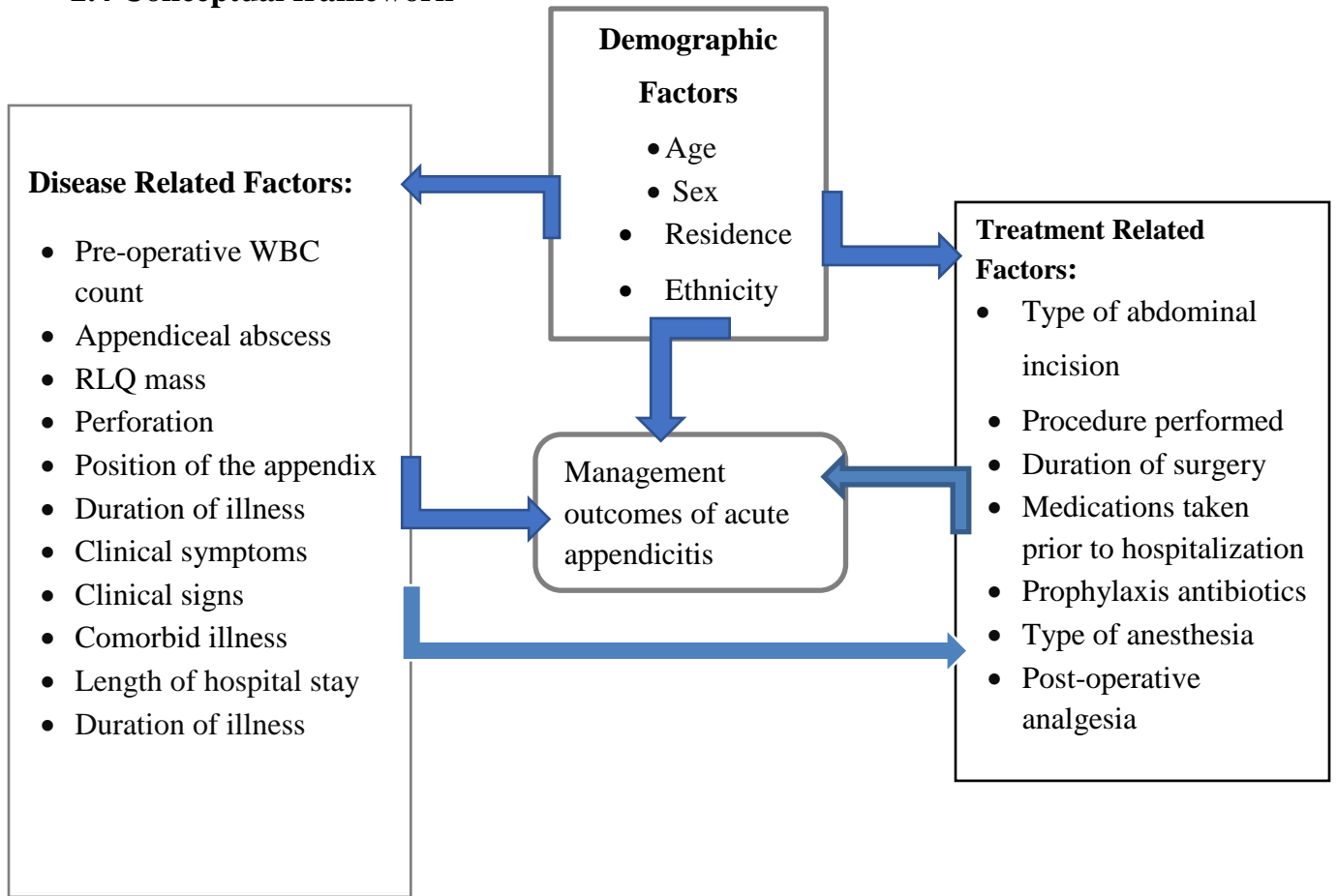


Figure 1: Conceptual frame work show factors associated with management outcomes of acute appendicitis developed by reviewing different literatures (1, 16, 34, 36, 48).

3. OBJECTIVES

3.1. General objective

- ✓ To assess the operative management outcomes of acute appendicitis and associated factors among patients operated for acute appendicitis in FHCSH, from September 2018 to September 2020.

3.2. Specific objectives

- ✓ To describe the operative management outcomes of acute appendicitis.
- ✓ To identify factors associated with unfavorable operative management outcomes of acute appendicitis.

4. METHODS

4.1. Study design and study period

Facility based cross sectional study design was conducted from march 1-30, 2021 by reviewing patient cards who get operated for acute appendicitis from September 1,2018 to September 1, 2020.

4.2. Study area

The study was conducted in Felege Hiwot comprehensive specialized hospital which is found in Bahir Dar city. Bahir Dar is the capital city of Amhara National Regional State (ANRS), located 565 km north west of Addis Abeba. The city has two comprehensive specialized hospital, one District Hospital, ten health centers, ten health posts, four private hospitals, and higher clinics. The hospital gives service for an estimated of 1.5 million people with different in-patient and out-patient wards. FHCSH has seven wards with 869 professional and 179 administrative staffs.

4.3. Population

4.3.1. Source population

All patients who were operated for acute appendicitis at FHCSH from September 1, 2018 to September 1, 2020.

4.3.2. Study population

All selected patients who were operated for acute appendicitis in FHCSH from September 1, 2018 to September 1, 2020.

4.3.3. Eligibility criteria

Inclusion criteria

- All operated patients with acute appendicitis on the study period

Exclusion criteria

- Patients with acute appendicitis who have incomplete records to fill the dependent variable
- Patients intra operative diagnosis other than appendicitis.

4.4. Sample size determination and sampling technique.

4.4.1. Sample size determination

The required sample size was determined by using single population proportion formula, with the assumption of 95% confidence level, 5% margin of error (d), and estimating a proportion (p) 26.6%, from unfavorable operative treatment outcome.(36)

$$n = [(Z_{\alpha/2})^2 \times P(1-P)]/d^2 = 300$$

The total sample size is 300.

Sample size for the second objective by use Fleiss formula was calculated from the study conducted in the significant variables associated with operative treatment outcome of acute appendicitis.

Table 1: sample size determination for associated factors for operative treatment outcomes of acute appendicitis in FHCSH, Northwest, Ethiopia, 2021

Variables	Assumptions					
	power	Ratio	P1	CI%	P2	N
WBC count	80%	1	49.3	95	10.2	52
Appendiceal abscess	80%	1	59.5	95	15.7	46
RLQ mass	80	1	28	95	78.6	36
Length of hospital stay	80	1	1.5	95	27.8	16

Key; Ratio=unexposed: exposed, P1=% of outcome in exposed group, P2=% of outcome in unexposed group, N=sample size, RLQ=right lower quadrant

The sample size is determined through StatCalc function of Epi Info version 7 software for each objective with the assumptions of 95% confidence interval, 5% marginal error, 80% power, unexposed to exposed ratio, percent outcome in unexposed group, and adjusted odds ratio of each major factors from the previous studies [(1, 34, 36)] and the maximum calculated sample size is taken. Therefore, the final sample size was 300.

4.4.2. Sampling technique

First, all operative records from major operation register book in the operation room was reviewed to identify patients operated for acute appendicitis from September 2018 to September 2020 and sorted based on their unique medical register number starting from the least and was coded (1,2,3). Then using systematic random sampling technique patient cards was selected until the required sample size is obtained in every kth (where $K=N/n$) $K=2$, $N=600$. The first study subjects were selected by using lottery method from the first K of patient charts. Every K^{th} interval the selected charts was taken out from the card room. The data collectors were fill the required data from the selected charts.

4.5. Data collection and procedure

Checklist prepared in English was used as data collection and data collection procedure was started from operation registration logbooks in the operation room of the hospital followed by collecting the relevant cards from the card room by trained data collectors under supervision. Based on the inclusion and exclusion criteria of the study, appropriate information was gathered and entered in to the prepared checklist.

4.6. Data quality control

The data was collected by using semi structured checklist from the patient's chart. The selected charts were taken from the card room. Then a total of 2 collectors were trained who are BSC nurses by the principal investigator. Checklist was distributed to the data collectors then the required data was filled from the selected charts Before data collection is started patients' card and surgery registration books were collected and cross matched. The checklist was checked to avoid any errors.

Completely filled checklists were submitted daily to the principal investigator after completeness was checked by the principal investigator.

4.7. Study variables

4.7.1. Dependent variables

- Management outcomes of acute appendicitis. (favorable and unfavorable)

4.7.2. Independent variables

Demographic Factors

- Age
- Sex
- Residence
- Ethnicity

Disease Related Factors:

- Duration of illness
- Clinical symptoms
- Intra-operative findings.
- Preoperative WBC count
- Comorbid illness
- length of hospital stay
- position of the appendix

Treatment Related Factors:

- Type of abdominal incision
- Procedure performed
- Duration of surgery
- Medications taken prior to hospitalization
- Prophylaxis antibiotics
- Type of anesthesia
- Post operative analgesia

4.8. Operational definition

Acute appendicitis: patients having sign and symptoms of appendicitis and diagnosed as acute appendicitis by the clinician.

Acute abdomen: - any sudden condition with chief manifestation of pain of recent onset in the abdominal area which may require urgent surgical intervention (49).

Outcome: Condition of the patient at discharge (either improved with no postoperative complication(s) or developed one or more complications) (36).

Favorable outcome: – patients with diagnosis and operated for acute appendicitis improved and discharged from hospital with no postoperative complications (36).

Unfavorable outcome: – Patients with a clinical examination (history, physical examination), laboratory investigation and ultra-sonographic diagnosis of acute appendicitis who developed one or more postoperative complication. (e.g., wound infection, fistula, intestinal obstruction, or who have died intra- or postoperatively.) until the patient is discharged from the hospital (36)

Normal appendix: The vermiform appendix without any sign of inflammation, gangrene, abscess or perforation (57).

Complicated appendicitis: Defined as appendicitis with perforation, or abscess, or gangrene or mass formation, or a combination of the above findings.

Appendectomy: -Surgical Removal of appendix (49).

Clinical manifestation: -Sign and symptom of the case (49)

Intra-operative finding: -The finding after abdomen is opened which can be normal, inflamed, gangrenous, abscess, perforated etc. (49).

Operative management: -Means surgical management.

Procedure performed: -The procedure that can be done after opening the abdomen which can be appendectomy, appendectomy with abscess drainage etc.

Postoperative wound infection: An infection in the tissues of the incision and operative area (57).

Length of hospital stay: – Number of days elapsed while the patient is in the hospital (36)

Clinical diagnosis of acute appendicitis: - Initial clinical assessment in acute appendicitis without employment of imaging modalities, laparoscopy or any other adjunct diagnostic test (57)

Leukocytosis: – laboratory finding of $WBC >10,000/mm^3$

4.9. Data processing, analysis and interpretation

Data clean up and cross-checking was done before analysis. Data was checked, coded, and completed. Questionnaires were given identification numbers and entered to Epi info version 7 then it was exported to SPSS version 25 for analysis. Both descriptive and analytical statistical procedures were utilized. Descriptive statistics like percentage, mean, and standard deviation was used for the presentation of socio-demographic data and operative outcomes of acute appendicitis. Tables were also used for data presentation. Binary logistic regression was used to identify factors associated with operative management outcomes of acute appendicitis among patients operated for acute appendicitis in Felege Hiwot Comprehensive Specialized Hospital from September 2018 to September 2020, North West, Amhara, Ethiopia. All explanatory variables with a p-value of ≤ 0.25 from bivariable logistic regression model was fitted into the multivariable logistic regression model to control the possible effect of confounders and finally, the variables which were have been independent association with operative management outcome of acute appendicitis were identified on the basis of AOR, with 95% CI and a p-value less than 0.05 will be significant. Model fitness was checked by using Hosmer and Lemeshow goodness of a fit test.

4.10. Ethical consideration

The ethical issue of this study was approved by Institutional Review Board of the Bahir Dar University, CMHS. Official letter was written to FHCSH, and official permission to undertake the study was obtained from the Hospital. The supportive staffs (i.e., Card room workers), Operation Room and surgical staffs was informed about the purpose of the study and informed voluntary, written and signed consent was obtained from the chief executive officer. Confidentiality of patient's information was assured.

4.11. Dissemination of results

The result of the study will be present to Bahir Dar University community as part of IESO thesis; and it will be disseminated to Bahir Dar university college of health sciences, Department of Integrated Emergency surgery and Obs/Gyn, Regional health bureau, FHCSH, zone and district health offices.

5. Results

5.1 Sociodemographic characteristics

From all 300 patients operated for appendicitis and with its complications 177(59%) were males and 123(41%) were females. Moreover, 165 (55%) of patients were urban and 135 (45%) were rural dwellers. Most of the patients (41.3%) were within the age of 21-30 years. The median age of the patient was 25years with inter quartile range of 12years.

Table 2 Sociodemographic characteristics of patients operated for a clinical diagnosis of acute appendicitis from September 1 2018 to 2020 (n =300).

Variables		Frequency	Percentage
Sex	Male	177	59
	Female	123	41
Residence	Urban	165	55
	Rural	135	45
Age group years	≤20 years	99	33
	21-30	124	41.3
	31-40	30	10.0
	41-50	19	6.3
	>50 years	28	9.3
Ethnicity	Amhara	286	95.3
	Oromo	8	2.7
	Tigre	6	2.0
	Others	0	0

5.2 Clinical symptom, sign and investigation profile of patients with appendicitis

5.2.1 Clinical symptoms

Abdominal pain was the main presenting complaint of patients with acute appendicitis. Among the patient of appendicitis, 220 (73.3%) had an initial periumbilical pain that latter shifted to the RLQ of the abdomen, 58(19.3%) had RLQ abdominal pain, 22 (7.3%) had unspecified abdominal pain. From those operated patients 125(41.7%) presented within 24hr with the median duration of illness of 48hrs. Additionally, from the study participants who presented with loss of appetite, vomiting, nausea and fever were 247(82.3%), 247(82.3%), 267(89%) and 187(62.3%) respectively. Out of the patients, 18 (6%) had urinary symptoms like dysuria, hematuria 17 (5.7%) had diarrhea and 6 (2%) had constipation as their presenting complaints. From subjects who participated in the study 208 (69.3%) did not taken any medication before admission.

5..2.2 Clinical signs

The physical finding of the patients showed that 77 (25.7%) patients had positive obturator sign, 70 (23.3%) of patients had positive psoas and 70(23.3%) had positive rovising sign. Majority of patients 247 (82.3%) had RLQ abdominal tenderness. Twenty-nine patients were presented with RLQ abdominal mass.

5.2.3 Investigation profiles

CBC was done for all patients. Of whom, 231 (77%) had raised WBC count (>10,000cells/mm³).

Table 3 clinical symptoms of patients operated for acute appendicitis in FHCSRH from 1/2018-1/2020

Variables		Frequency	Percentage
Abdominal pain	Periumbilical pain shifting to RLQ	220	73.3
	RLQ	58	19.3
	Unspecified site	22	7.3
Loss of appetite	yes	247	82.3
	No	53	17.7
Vomiting	1episode	103	34.3
	2 episodes	63	21
	3 episodes	59	19.7
	≥4episodes	22	7.3
	No vomiting	53	17.7
Nausea	yes	267	89
	No	33	11
Fever	No fever	113	37.7
	Low grade	169	56.3
	High grade	18	6
Diarrhea	yes	17	5.7
	No	283	94.3
Constipation	yes	6	2
	No	294	98
Urinary symptom	yes	18	6
	No	282	94
Medication taken prior to admission	yes	92	30.7
	NO	208	69.3

Table 4 clinical sign and laboratory investigations of operated patients for acute appendicitis in FHCSRH from 1/2018-1/2020

Variables		Frequency	Percentage
Psoas sign	yes	70	23.3
	No	230	76.7
Obturator sign	yes	77	25.7
	No	223	74.3
Rovising sign	yes	70	23.3
	No	230	76.7
Abdominal tenderness location	RLQ	247	82.3
	Unspecified	12	4
	Generalized	41	13.7
RLQ mass	yes	29	9.7
	No	271	90.3
Raised WBC >10000cells/mm3	yes	231	77
	No	69	23
Chronic illness	yes	7	2.3
	No	293	97.7

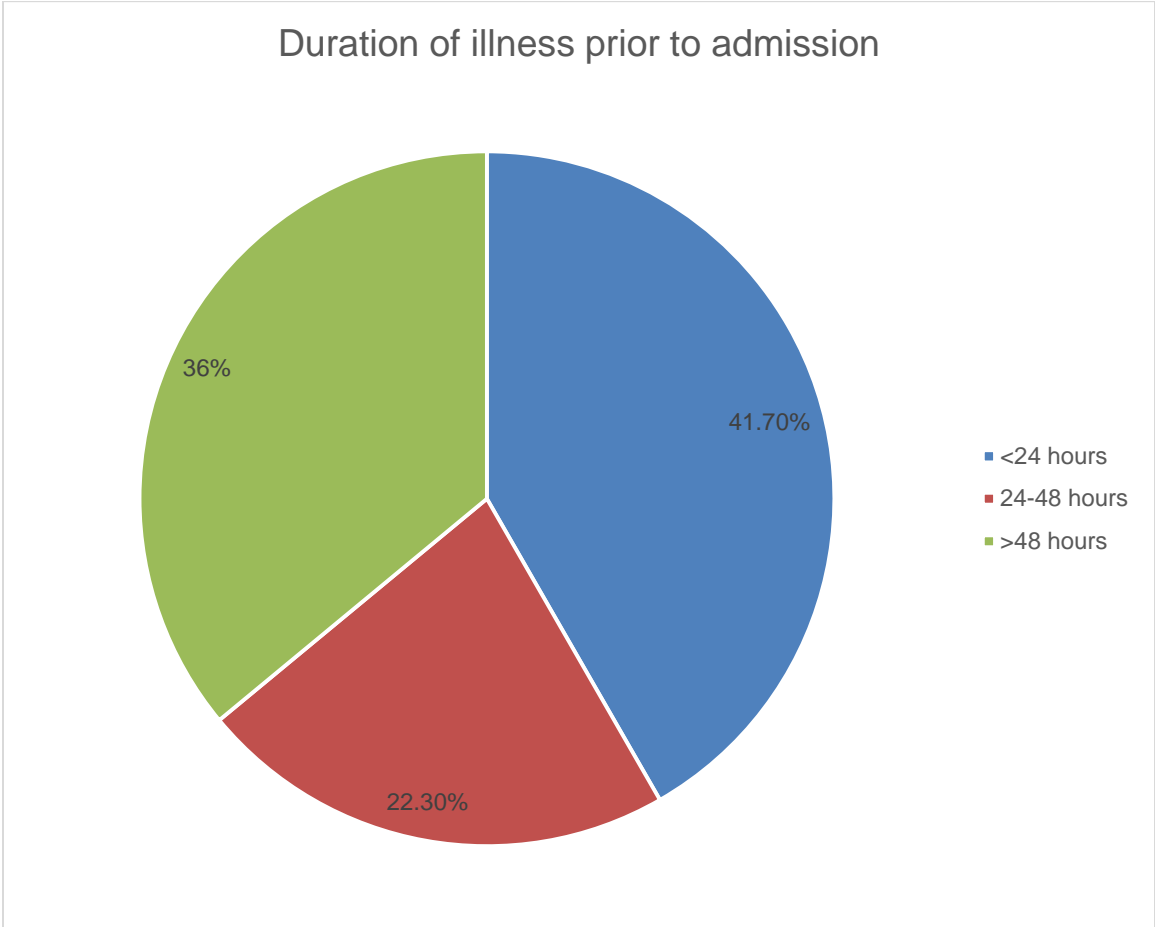


Figure 2 ; Duration of illness prior to admission of acute appendicitis patients at FHCSH from September 2018-2020

5.3 Management procedures for acute appendicitis

Majority of patients (98.3%) were given preoperative IV antibiotics. The most common type of abdominal incision was RLQ transverse incision (82.7%; n=248) followed by lower midline vertical incision (12.7%; n=11). Majority of patients (95%) were taken general anesthesia. The most common intraoperative findings were an inflamed appendix (42.7%; n =128) followed by perforated appendix (22.7%; n=68). The position of appendix of the patients were retrocecal (71.7%; n = 215). The commonest operative procedure done was appendectomy (73.3%; n=220) followed by appendectomy with peritoneal lavage (17%; n =51) and abscess drainage with lavage (9.7%, n=29). Duration of surgery for most of patients were less than one hour with a median duration of 60 minutes. (75%, n=225).

All most all operated patients were taken post-operative analgesia (99.7%, n=299).

Among 300 patients who were operated, 51 (17%) of them developed postoperative complications (unfavorable treatment outcomes). The major postoperative complications were wound infection (10%; n =30), wound dehiscence (2.7%, n=8) pneumonia (2.3%; n=7), fistula (0.7%; n =2) and death (0.7%; n = 2). Majority of operated patients (157 (52.3%)) stayed in the hospital for <3 days with the median of 3days.

Table 5 Management related profiles of patients operated for a clinical diagnosis of acute appendicitis from 2018 to 2010 (n =300).

Variable's		frequency
Percentage		
Type of abdominal incision		
RLQ transverse	248	82.7
Lower midline	38	12.7
McBurney	13	4.3
Others	1	0.3
Position of appendix		
Retrocecal	215	71.7
Pelvic	50	16.7
Sub cecal		34
11.3		
Others	1	0.3
Length of hospital stay		
< 3 days	157	52.3
3-5 days		107
35.7		
≥ 6 days	36	12
Condition at discharge		
Improved	295	98.3
Complicated	3	1
Dead	2	0.7
Procedure performed		
Appendectomy	220	73.3
Abscess drainage and lavage	29	9.7

Peritoneal lavage & appendectomy

51

17



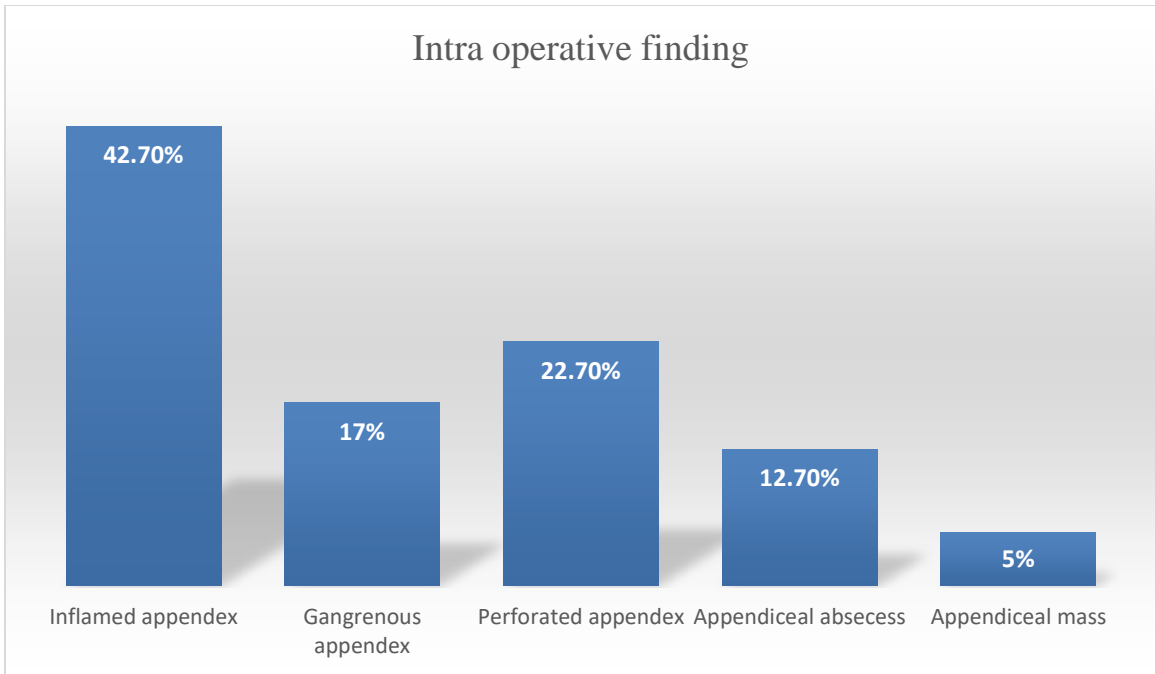


Figure 3: Intra operative finding of patients operated for acute appendicitis in FHCSH from September 2018-2020

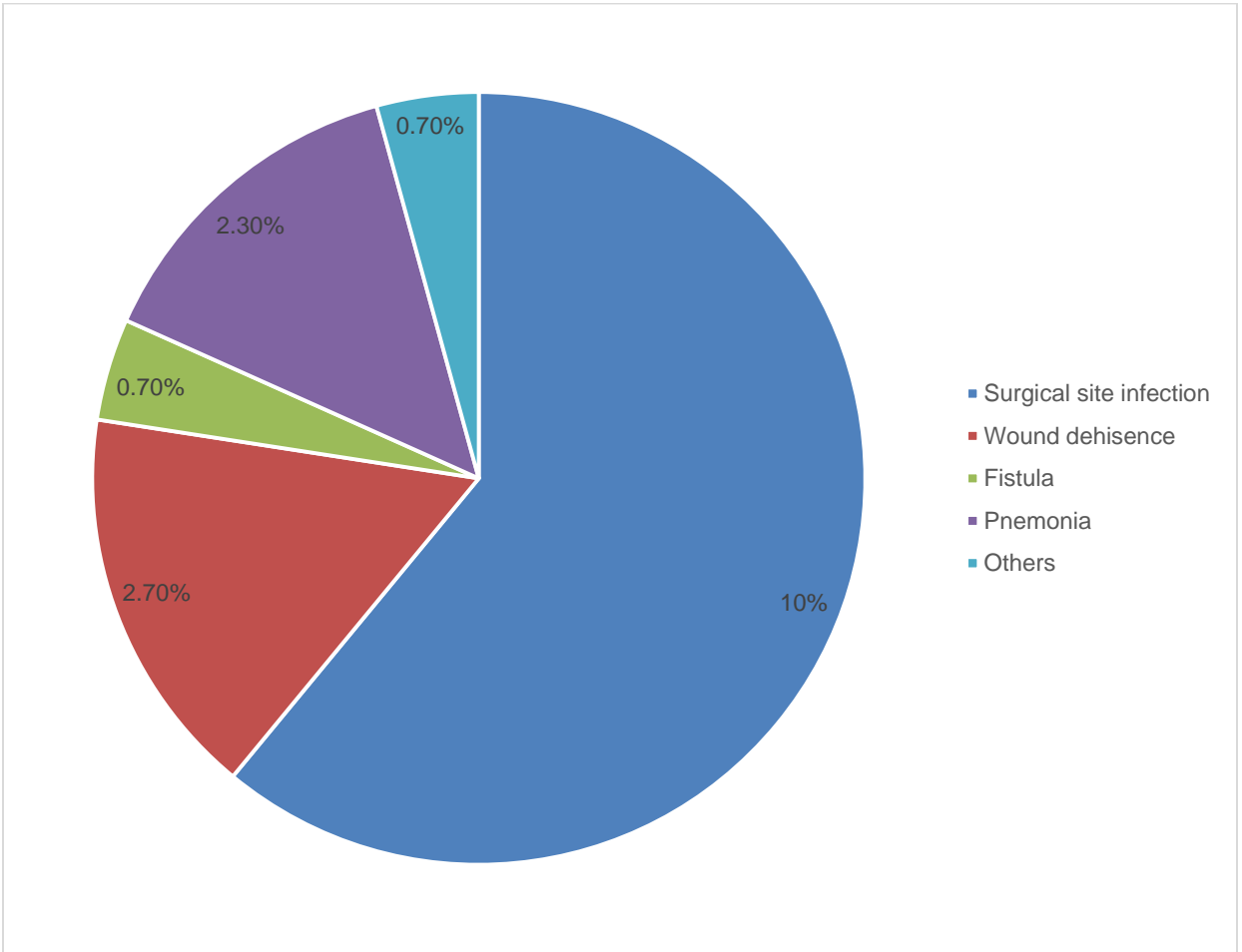


Figure 4: Post-operative complication of acute appendicitis patients at FHCSH from September 2018- September 2020

5.4 Factors affecting treatment outcomes of acute appendicitis

In bivariable logistic regression analysis, age, fever, abdominal pain location, history of vomiting, abdominal tenderness location, intraoperative finding, type of procedure done and duration of illness were statistically associated with treatment outcome of acute appendicitis. However, only three variables were statistically associated with treatment outcome of acute appendicitis after adjusting for possible confounders. These were generalized abdominal tenderness, perforated appendicitis and appendiceal abscess. Patients who had generalized tenderness were 3.7 times more likely to develop unfavorable outcome than those with RLQ tenderness. Those patients who had intraoperative perforated appendicitis were 5.3 times more likely to had unfavorable treatment outcome as compared to patients who had an inflamed appendix. Similarly, patients who had an intraoperative finding of appendiceal mass were 6.7 times more likely to develop unfavorable treatment outcome as compared to those who had inflamed appendix.

Table 6 Factors affecting treatment outcome of acute appendicitis from 2018 to 2020(n=300)

Variables	Unfavorable	favorable	COR [95%CI]	AOR [95%CI]	P-value
Abd tenderness location					
RLQ	28	219	1	1	
Unspecified	5	7	5.6 (1.66,18.79)	3.98 (1.08,14.59)	0.37
Generalized	18	23	6.1 (2.95,12.72)	3.7 (1.64,8.39)	0.002
Intra operative finding					
Inflamed appendix	8	120	1	1	
Gangrenous appendix	7	44	2.4 (0.82,6.97)	1.9 (0.62,5.63)	0.265
Perforated appendix	25	43	8.7 (3.66,20.79)	5.3 (2.07,13.51)	0.001
Appendiceal abscess	6	32	2.8 (0.91,8.69)	2.03 (0.62,6.065)	0.244
Appendiceal mass	5	10	7.5 (2.06,27.25)	6.7 (1.78,25.18)	0.005
Duration of illness					
<24hours	14	111	1	1	
24-48hours	5	62	0.64 (0.22,1.86)	0.5 (0.15,1.53)	0.218
>48hours	32	76	3.3 (1.67,6.67)	1.4 (0.59,3.33)	0.434
Types of procedure done					
Appendectomy	26	194	1	1	
Abscess drainage & lavage	7	22	2.4 (0.92,6.10)	1.4 (0.27,7.07)	0.70
Appendectomy & peritoneal lavage	18	33	4.1 (2.01,8.24)	0.63 (0.15,2.56)	0.52

Table 7 Factors affecting treatment outcome of acute appendicitis from 2018 to 2020(n=300)

Variables	Unfavorable	favorable	COR [95%CI]	AOR [95%CI]	P-value
Age					
≤20years	10	89		1	
21-30years	18	106		1.5 (0.66,3.44)	
31-40years	7	23		2.7 (0.93,7.89)	
41-50years	6	13		4.1 (1.28,13.2)	
>50years	10	18		4.9 (1.79,13.63)	
Fever					
no fever	17	96		1	
Low grade fever	29	140		1.2 (0.61,2.25)	
High grade fever	5	13		2.2 (0.69,6.88)	
Abd pain location					
Periumbilical shifting to RLQ	34	186		1	
RLQ		11	47	1.3 (0.6,2.71)	
Unspecified	6		16	2.1 (0.75,5.62)	
Vomiting					
No vomiting		11	42	1	
One episode of vomiting		13	90	0.6 (0.23,1.33)	
Two episodes of vomiting		9	54	0.6 (0.24,1.68)	
Three episodes of vomiting		10	49	0.8 (0.30,2.02)	
≥ four episodes of vomiting	8	14		2.2 (0.73,6.51)	

6 Discussion

In this study 17% of patients developed unfavorable treatment outcomes of acute appendicitis with postoperative complications. The most common unfavorable outcomes were wound infection, wound dehiscence, pneumonia, fistula and death. This study is in line with the studies conducted in Jimma university, Sudan and America 14.3%, 16.5%, 16% respectively. (28, 46, 57). However, this finding is lower than studies conducted in Debre Markos (26.6%), Mizan Aman (31.9%), India (51%). (1, 36, 44) In this study the commonest unfavorable outcome was wound infection which accounts 10%. This finding is lower than studies done in Debre Markos (13.6), Nekemit (19.9%), Woliso (48.7%), Mizan Aman (66%), Nigeria (18.6), India (20%), Pakistan (13%), Finland (13%). But higher than the study done in Mettu Karl hospital (7.4%). This study is comparable with the study done in Sudan (9.7%) (1, 19, 20, 30, 34-36, 44) The possible explanation for the above discrepancy could be the difference in socioeconomic and organizational set-up among countries.

Intraoperative finding of perforated appendicitis, appendiceal mass and generalized abdominal tenderness were the factors associated with treatment outcome of acute appendicitis in this study. Patients who had intraoperative perforated appendicitis were more likely to develop an unfavorable acute appendicitis treatment outcome as compared to those who had simply inflamed appendicitis. This was supported by a study done in Mizan Aman, Mettu Karl hospital, India, Rajashali medical college hospital and America (1, 22, 25-27, 48, 57). Patients with generalized abdominal tenderness were more likely to develop unfavorable treatment outcome. Similarly, those patients who had an intraoperative appendiceal mass were more likely to develop unfavorable acute appendicitis treatment outcome as compared to patients with acutely inflamed appendicitis. This finding was in line with the study done in Mizan Aman and Mettu Karl hospital (1, 57). The possible explanation might be due to the fact that prolonged duration of illness prior to admission to hospital that is most of perforated patients come after 48hours (60.3%). The other explanation might be prolonged hospital stay (54.4% stay 3-5 days).

7 Conclusions and Recommendations

7.1 Conclusions

The treatment outcome of acute appendicitis was almost good relative to study done elsewhere

Majority of patients with acute appendicitis were in the second and third decades of life.

Majority of complicated patients come from rural area.

Males are more affected than females.

Periumbilical pain shifting to the RLQ is invariably the main presenting complaint.

In this study the mortality rate was 2/300(0.7%).

In this study intraoperative finding of perforated appendicitis, mass and generalized abdominal tenderness independently affects the management outcomes of acute appendicitis.

7.2 Recommendations

Based on the study findings the following recommendations were forwarded:

When patients who are in their second and third decades of life present with abdominal pain, they need to be assessed thoroughly for acute appendicitis.

The treating clinicians need to have high index of suspicion of acute appendicitis for male patients.

Patients with generalized abdominal tenderness should be assessed carefully and act immediately.

Patients with an intraoperative finding of perforated appendicitis and appendiceal mass should be managed appropriately and followed closely in the post-operative period.

Surgical ward and operation theater staffs should revise their infection prevention and adhere to universal infection prevention protocol.

Early referral of patients with sign and symptom of abdominal pain, anorexia and RLQ abdominal tenderness and linkages between peripheral health facilities and the hospital should be strengthened.

REFERENCES

1. Jangale T, Tolu G, Workeneh D. Prevalence, management outcome and factors affecting management outcome of acute appendicitis at mizan aman general hospital, southwest Ethiopia, 2011-2014 2014.
2. Atalay M, Gebremickael A, Demissie S, Derso Y. Magnitude, Pattern and Management Outcome of Intestinal Obstruction among Non-Traumatic Acute Abdomen Surgical Admissions in Arba Minch General Hospital, Southern Ethiopia. 2021.
3. Sellars H, Boorman P. Acute appendicitis. *Surgery (Oxford)*. 2017;35(8):432-8.
4. Kraemer M, Franke C, Ohmann C, Yang Q, Group AAPS. Acute appendicitis in late adulthood: incidence, presentation, and outcome. Results of a prospective multicenter acute abdominal pain study and a review of the literature. *Langenbeck's archives of surgery*. 2000;385(7):470-81.
5. Bech-Larsen SJ, Lalla M, Thorup JM. The influence of age, duration of symptoms and duration of operation on outcome after appendicitis in children. *Dan Med J*. 2013;60(8):A4678.
6. Andersson RE. The natural history and traditional management of appendicitis revisited: spontaneous resolution and predominance of prehospital perforations imply that a correct diagnosis is more important than an early diagnosis. *World journal of surgery*. 2007;31(1):86-92.
7. Andersen BR, Kallehave FL, Andersen HK. Antibiotics versus placebo for prevention of postoperative infection after appendectomy. *Cochrane Database of systematic reviews*. 2003(2).
8. Sheu BF, Chiu TF, Chen JC, Tung MS, Chang MW, Young YR. Risk factors associated with perforated appendicitis in elderly patients presenting with signs and symptoms of acute appendicitis. *ANZ journal of surgery*. 2007;77(8):662-6.
9. Harrell AG, Lincourt AE, Novitsky YW, Rosen MJ, Kuwada TS, Kercher KW, et al. Advantages of laparoscopic appendectomy in the elderly. *The American Surgeon*. 2006;72(6):474-80.
10. Bratton SL, Haberkern CM, Waldhausen JH. Acute appendicitis risks of complications: age and Medicaid insurance. *Pediatrics*. 2000;106(1):75-8.
11. Arif AS, Amin S, Quamruzzaman S, Rahman MA. Diagnosing acute appendicitis in children using Alvarado score. *Anwer Khan Modern Medical College Journal*. 2011;2(2):11-3.
12. Kumar MP, Reddy AT, Prasad AS. Timing of surgery as a predictive factor of complicated appendicitis and postoperative outcome.
13. McGory ML, Zingmond DS, Tillou A, Hiatt JR, Ko CY, Cryer HM. Negative appendectomy in pregnant women is associated with a substantial risk of fetal loss. *Journal of the American College of Surgeons*. 2007;205(4):534-40.
14. Andersen B, Nielsen T. Appendicitis in pregnancy, diagnosis, management and complications. *Acta obstetrica et gynecologica Scandinavica*. 1999;78(9):758-62.
15. Ceresoli M, Zucchi A, Allievi N, Harbi A, Pisano M, Montori G, et al. Acute appendicitis: Epidemiology, treatment and outcomes-analysis of 16544 consecutive cases. *World journal of gastrointestinal surgery*. 2016;8(10):693.
16. James M. Acute appendicitis. *InnovAiT*. 2017;10(10):602-7.
17. Laal M, Mardanloo A. Acute abdomen; pre and post-laparotomy diagnosis. *International Journal of Collaborative Research on Internal Medicine & Public Health*. 2009;1(5):0-.
18. Ferris M, Quan S, Kaplan BS, Molodecky N, Ball CG, Chernoff GW, et al. The global incidence of appendicitis: a systematic review of population-based studies. *Annals of surgery*. 2017;266(2):237-41.

19. Kotaluoto S, Ukkonen M, Pauniahho S-L, Helminen M, Sand J, Rantanen T. Mortality related to appendectomy; a population based analysis over two decades in Finland. *World journal of surgery*. 2017;41(1):64-9.
20. AHMAD N, ALI AA. Acute Appendicitis is Still a Morbid Disease in the Developing World.
21. Naderan M, Babaki AES, Shoar S, Mahmoodzadeh H, Nasiri S, Khorgami Z. Risk factors for the development of complicated appendicitis in adults. *Turkish Journal of Surgery/Ulusal cerrahi dergisi*. 2016;32(1):37.
22. Hakim SMA, Sarkar MH, Chowdhury MRS. Risk Factors of Perforation of Appendix and Unfavorable Outcome in Delayed Presentation of Acute Appendicitis: A Cross-Sectional Analysis. *TAJ: Journal of Teachers Association*. 2017;30(1):42-8.
23. Bonadio W, Brazg J, Telt N, Pe M, Doss F, Dancy L, et al. Impact of in-hospital timing to appendectomy on perforation rates in children with appendicitis. *The Journal of emergency medicine*. 2015;49(5):597-604.
24. Fair BA, Kubasiak JC, Janssen I, Myers JA, Millikan KW, Deziel DJ, et al. The impact of operative timing on outcomes of appendicitis: a National Surgical Quality Improvement Project analysis. *The American Journal of Surgery*. 2015;209(3):498-502.
25. Boomer LA, Cooper JN, Anandalwar S, Fallon SC, Ostlie D, Leys CM, et al. Delaying appendectomy does not lead to higher rates of surgical site infections. *Annals of surgery*. 2016;264(1):164-8.
26. Ingraham AM, Cohen ME, Bilimoria KY, Ko CY, Hall BL, Russell TR, et al. Effect of delay to operation on outcomes in adults with acute appendicitis. *Archives of Surgery*. 2010;145(9):886-92.
27. Serres SK, Cameron DB, Glass CC, Graham DA, Zurakowski D, Karki M, et al. Time to appendectomy and risk of complicated appendicitis and adverse outcomes in children. *JAMA pediatrics*. 2017;171(8):740-6.
28. Margenthaler JA, Longo WE, Virgo KS, Johnson FE, Oprian CA, Henderson WG, et al. Risk factors for adverse outcomes after the surgical treatment of appendicitis in adults. *Annals of surgery*. 2003;238(1):59.
29. Johnson AB. CURRENT TRENDS OF ACUTE APPENDICITIS IN AFRICA: A CLINICAL.
30. Balogun OS, Osinowo A, Afolayan M, Olajide T, Lawal A, Adesanya A. Acute perforated appendicitis in adults: Management and complications in Lagos, Nigeria. *Annals of African medicine*. 2019;18(1):36.
31. Cohen-Arazi O, Dabour K, Bala M, Haran A, Almogy G. Management, treatment and outcomes of acute appendicitis in an elderly population: a single-center experience. *European Journal of Trauma and Emergency Surgery*. 2017;43(5):723-7.
32. Theilen LH, Mellnick VM, Shanks AL, Tuuli MG, Odibo AO, Macones GA, et al. Acute appendicitis in pregnancy: predictive clinical factors and pregnancy outcomes. *American journal of perinatology*. 2017;34(06):523-8.
33. Hernandez MC, Finnesgaard E, Aho JM, Kong VY, Bruce JL, Polites SF, et al. Appendicitis: rural patient status is associated with increased duration of prehospital symptoms and worse outcomes in high-and low-middle-income countries. *World journal of surgery*. 2018;42(6):1573-80.
34. Dagebo C, Alemu S, Bedada D. Southwest Shoa, Woliso, Ethiopia.
35. Aylate R, Muleta G, Amenu D. Assessing the prevalence and treatment outcomes of acute appendicitis at nekemit referral hospital, nekemite town, oromia, Ethiopia 2014.
36. Afenigus AD, Bayie AM, Kassahun B. Treatment outcomes of Acute Appendicitis and associated factors among admitted patients with a diagnosis of Acute Abdomen in Debre

- Markos referral hospital, Amhara region, North West Ethiopia. *Journal of Perioperative Practice*. 2019;1750458920928473.
37. Zinner MJ, Ashley SW, Hines OJ. *Maingot's abdominal operations*: McGraw-Hill Education; 2019.
 38. Al-Omran M, Mamdani MM, McLeod R. Epidemiologic features of acute appendicitis in Ontario, Canada. *Canadian journal of surgery*. 2003;46(4):263.
 39. Dhupar R, Evankovich J, Ochoa JB, Vargas LG, Hughes SJ. Outcomes of operative management of appendicitis. *Surgical infections*. 2012;13(3):141-6.
 40. Guy S, Wysocki P. Risk factors for intra-abdominal abscess post laparoscopic appendectomy for gangrenous or perforated appendicitis: A retrospective cohort study. *International Journal of Surgery Open*. 2018;10:47-54.
 41. Alegbeleye BJ, Adisa CA, Keskin H. Epidemiologic Features of Acute Appendicitis in A Tropical African Population. *Peninsula*. 2019;30:31.
 42. Deneke A, Tadesse B. Pattern and clinical presentation of acute appendicitis in adults in Zewditu Memorial Hospital. *Ethiopian Journal of Health Sciences*. 2003;13(2):117-23.
 43. Kotiso B, Abdurahman Z. Pattern of Acute Abdomen in Adult Patients in Tikur Anbessa Teaching Hospital, Addis Ababa, Ethiopia. *East and central African journal of surgery*. 2007;12(1):47-52.
 44. Pramod T, Prakashkumar M. Surgical outcome in patients with complicated appendicitis treated at a medical college hospital. *International Surgery Journal*. 2019;6(7):2379-85.
 45. Ekpemo SC. Complicated appendicitis in Children in Aba, Nigeria. *Innovative Journal of Medical and Health Science*. 2019;9(11):661-4.
 46. Makki MARM, Hamza AA. Outcome of appendectomy: Early versus late presentation.
 47. Kong V, Sartorius B, Clarke D. Acute appendicitis in the developing world is a morbid disease. *The Annals of The Royal College of Surgeons of England*. 2015;97(5):390-5.
 48. IAMARINO AP, Juliano Y, ROSA O, Novo NF, Favaro MdL, JÚNIOR R, et al. Risk factors associated with complications of acute appendicitis. *Revista do Colégio Brasileiro de Cirurgiões*. 2017;44(6):560-6.
 49. Gebrie T, Handiso T, Hagisso S. Management Outcome and Associated Factors of Surgically Treated Non Traumatic Acute Abdomen at Attat Hospital, Zone, Ethiopia. *Int J Surg Res Pract*. 2019;6:099.
 50. Janan A, Ahmad M, Wazir A. Risk factors for perforation in acute appendicitis. *Journal Of Medical Sciences*. 2012;20(1):11-4.
 51. Westfall KM, Charles AG. Risk of perforation in the era of nonemergent management for acute appendicitis. *The American Surgeon*. 2019;85(11):1209-12.
 52. Fashina I, Adesanya A, Atoyebi O, Osinowo O, Atimomo C. Acute appendicitis in Lagos: a review of 250 cases. *The Nigerian postgraduate medical journal*. 2009;16(4):268-73.
 53. Yang E, Cook C, Kahn D. Acute appendicitis in the public and private sectors in Cape Town, South Africa. *World journal of surgery*. 2015;39(7):1700-7.
 54. Peter SDS, Snyder CL, editors. *Operative management of appendicitis*. *Seminars in pediatric surgery*; 2016: Elsevier.
 55. Abou-Nukta F, Bakhos C, Arroyo K, Koo Y, Martin J, Reinhold R, et al. Effects of delaying appendectomy for acute appendicitis for 12 to 24 hours. *Archives of surgery*. 2006;141(5):504-7.
 56. Mutwali IM, Ibrahim MS. Acute Appendicitis: Pattern of Presentation and Outcome of Management.
 57. Ayana D, Yilma Y, Negash Y. athree years review of assessing the incidence and treatment outcomes of acute appendicitis at mettu karl hospital, oromia regional state, south western Ethiopia 2017.

ANNEXIS

Annex 1: Consent Form

My name is _____ I am working with Selamawit Shitie who is doing a research as partial fulfillment for the requirement of in Partial Fulfillment of the Requirements for Master of Science in Integrated Emergency Obstetrics, Gynecology and General Surgery at Bahir Dar University. We are going to collect information from the clients' card to assess the operative management outcomes of acute appendicitis and associated factors among patients operated for acute appendicitis in Felege Hiwot comprehensive specialized Hospital, from September 2018 to September 2020.

The patient's name will not be written in this form and the information I get from the client's card is kept confidential. If you do not want to allow me to collect information from the clients' card, you have the right to do so. However, your willingness to allow me to do so will be appreciated.

Thanks.

Annex 2. Data Extraction Format

This questioner designed to assess the operated management Outcomes of Acute Appendicitis and associated factors, in Felege Hiwot comprehensive specialized Hospital, Northwest, Amhara, Ethiopia.

Part I: Patient's Demographic Data

Que. No.	Questions	Coding Category
1	Coding	_____
2	Age in year	_____
3	Gender	1. Male 2. Female
4	Residence	1. Urban 2. Rural
5	Ethnicity	1.Amhara 2. Oromo.3 Tigray 4. Others

Part II: Disease Related Data

Q. n	Question	Category
1	Duration of illness prior to admission in hrs./days
2	Abdominal pain location	1.periumblical pain shifting to RLQ 2.RLQ3.unspecified site
3	Decreased or loss of appetite	1. yes 2. No
4	Vomiting	A.1 episode B.2-episode C 3. episodes D.4/>, multiple E 5.no vomiting.
5	Nausea.....	1. Yes 2. No
6	Fever	1. Normal 2.low grade 2. High grade.
7	Associated symptoms	1. Diarrhea 2. Constipation 3. Dysuria 4. Hematuria 5. Other specified ...6.no associated symptoms.
8	Any medication taken prior to admission.	1. Yes 2. No
9	Psoas sign	1. Yes 2. No
10	Obturator sign	1. Yes 2. No
11	Rovsing sign	1. Yes 2. No
12	Abdominal tenderness location	1.RLQ2.unspecified3. generalized

13	RLQ mass	1.yes	2.no
14	Raised WBC>10,000cells/mm ³	1.yes	2.no
15	Chronic illness	1.yes	2.no

Part III: Treatment Related Data

Q.	Question	Category
n		
1	Prophylactic antibiotics	1 yes 2.no
2	Type of abdominal incision	1.Rockey Davis/ RLQ transverse 2. Lower midline3.Mcburne 4. other....
3	Type of anesthesia	1. General 2. Regional
4	Intraoperative finding	1. Inflamed appendix.2. gangrenous appendix. 3. perforated/ruptured appendix .4. appendiceal abscess. 5.appendical mass.6. normal appendix. 7.. Others specified
5	Position of the appendix	1. Retrocecal 2. pelvic 3. sub cecal 4. other.....
6	Procedure performed	1. Appendectomy 2. Abscess drainage and lavage. 3. Negative laparotomy 4. Peritoneal lavage and appendectomy
7	Duration of surgery	-----hrs.
8	Post-operative analgesia	1.yes 2. No
9	Post op diagnosis	1.Same as preoperative dx (Acute appendicitis or its complications) 2.Different from preoperative diagnosis
10	Post op complication	1. Surgical site infection 2, Wound dehiscence, 3. fistula. 4. Pneumonia 5. other. 6.no complication.
11	Length of hospital stay in daysdays
12	Management out comes	1. favorable outcome.2. unfavorable outcome

Condition at discharge 1. Improved 2. complicated 3. dead
4. Referred. 5. Discharged against medical advice.

Name of data collector _____ Signature _____ Date---
