

MORBIDITY, MORTALITY AND ASSOCIATED FACTORS IN PATIENTS WITH EMERGENCY LAPAROTOMY

By: Abraham Wude (M.D, General Surgery Resident year IV)

SAINT PAUL'S HOSPITAL MILLINIUM MEDICAL COLLEGE

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**MORBIDITY, MORTALITY AND ASSOCIATED FACTORS
IN PATIENTS WITH EMERGENCY LAPAROTOMY IN
SPHMMC SURGICAL WARD, ADDIS ABEBA, ETHIOPIA,
2018**

By: Abraham Wude (M.D, General Surgery Resident year IV)

**Advisors: Engida Abebe (M.D, Associate professor of Surgery,
Renal Transplant Surgery)**

Shanko Gebru (M.D, Assistant Professor of surgery)

Department: Surgery

SAINT PAUL'S HOSPITAL MILLINUM MEDICAL COLLEGE

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ABSTRACT

BACKGROUND: Emergency surgery is specialty of surgery where decisions often need to be made urgently. An emergency laparotomy is a major operation that involves opening the abdomen (tummy) which allows the surgeon to view the organs inside and repair any emergency problems that have occurred. It is called “emergency” because it must be done very soon or even immediately and cannot wait until a later date. Emergency laparotomies are associated with high mortality and substantial outcome variation.

OBJECTIVE: To determine Morbidity, Mortality and Associated factors in patients for whom emergency laparotomy was done in SPHMMC surgical ward, Addis Ababa, Ethiopia, from September 1/2016 to August 30 /2017.

METHODS: -A retrospective record review Study design was conducted from *October /2017 - August /2018 G.C*, at St Paul’s Hospital Millennium Medical College (SPHMMC), Addis Ababa, Ethiopia. Study subjects was identified from the hospital log books (admission, discharge and operation) and individual patient charts was reviewed for the study variables. The data was collected by trained final year medical students.

After data was collected and data was analyzed using SPSS software. The analyzed data presented using charts, tables, and graphs and described using texts.

RESULT: A total of 390 emergency laparotomies were performed during the study period. Among those the records of 320 patients were retrieved for analysis making a retrieval rate of 82.01%. One hundred and five (33.4%) of operated patients had early (in-hospital) postoperative complications. The commonest complication was wound infection 42(13.1%), followed by Sepsis 25(7.8%) and pneumonia 21(6.67%). Overall, 35(10.9%), of the 320 patients, twenty three males and twelve females, died and accounting for an operative mortality rate of 10.94%.

After adjusting for confounding variables, vital sign at presentation (systolic <90mmhg) (odds ratio [AOR] = 0.158, P = 0.002), admission to ICU ([AOR] = 0.075, P=0.03) and early discharge from Hospital before one week ([AOR] =11.8, P=0.000) were independent predictors of post-operative complications in an emergency laparotomy.

Except early discharge; other two variables are protective to post-operative complication this is due to patients with (shock, admission to ICU) died early before they develop post-operative complications. Patients who were discharged earlier than one week had more than eleven times chance of developing post-operative complication compared to late discharge.

After adjusting for confounding variables, age more than 61 years (odds ratio [AOR] =20.280, P = 0.037, patient with comorbid illness (AOR =10.473, p=.016), vital sign at presentation (systolic <90mmhg) (odds ratio [AOR] =26.73, P = 0.001) and having complication post operatively (OR = 29.76, P = 0.00), were independent predictors of 30-day mortality in an emergency laparotomy.

CONCLUSION AND RECOMMENDATION:

Early discharge from Hospital result in higher post-operative complication in emergency laparotomy. Emergency laparotomy carries a high rate of mortality, 10.9 % overall, increasing to 28 % in those aged 61 years or older.

Patients with emergency laparotomy should not be discharged early so as to prevent complication. Patients who are older more than 61 years, presented with shock and who has comorbid illness are at higher risk to die post operatively, so more needs to be done to improve outcomes, particularly in this group. This could involve early recognition of patients requiring emergency surgery, adequate preoperative resuscitation and proper post-operative care would help to reduce the observed high mortality. Patients who develop post op complication had high risk of mortality, so early diagnosis and treatment of complication should be done to reduce post-operative mortality.

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Table of content

Contents

ABSTRACT.....	I
ACKNOWLEDGEMENTS.....	III
Table of content.....	IV
List of figures and tables	VI
ACRONYMS AND ABBREVIATIONS	VII
Operational definition	VIII
1. INTRODUCTION	1
1.1 BACKGROUND	1
1.2 STATEMENT OF PROBLEM.....	4
2. LITERATURE REVIEW	6
3. OBJECTIVE	12
3.1 General Objective	12
3.2 Specific Objectives	12
4. METHODS AND MATERIALS.....	12
4.1 Study area.....	12
4.2 Study Design and period	13
4.3 Populations.....	13
4.3.1 Source Population	13
4.3.2 Study population	13
4.4 Inclusion and exclusion criteria	13
4.4.1 Inclusion Criteria.....	13
4.4.2 Exclusion criteria	13
4.5 Sample size determination, sampling technique and sampling procedure.....	13
4.5.1 Sample size determination	13
4.6 Variables	13
4.6.1 Dependent Variable.....	13
4.6.2 Independent variables	14
4.6.2.1 Sociodemographic factors.....	14
4.6.2.2 Clinical	14
4.7 Data collection and procedure.....	14

4.7.1 Data collection tool and methods.....	14
4.7.2 Data collectors, supervisors and collection procedure	14
4.8 Data quality assurance	15
4.9 Data processing, interpretation and analysis.....	15
4.10 Ethical consideration.....	15
4.11 Dissemination of the results.....	15
4.12 limitation of study	15
5. Results.....	16
5.1 Discussion.....	27
5.2 Conclusions and Recommendation	30
References	31
ANNEX I: Information sheet.....	34
Annex II: Data collection Questionnaire	34
Questionnaire format	34
I. Socio-demographic data.....	34
II. Clinical Data	34

List of figures and tables

Table 1: Durations of symptoms patients operated as emergency laparotomy in SPHMMC, 2018.....	17
Table 2: The frequency and indication of emergency laparotomy in SPHMMC, 2018	18
Table 3: Operative diagnosis of patients who underwent emergency laparotomy in SPHMMC, 2018.....	18
Table 4: Frequency of types of surgery done in emergency laparotomy in SPHMMC, 2018.....	19
Table 5: Duration of surgery in emergency laparotomy in SPHMMC, in 2018	20
Table 6: Postoperative destination following emergency laparotomy in SPHMMC, 2018.....	20
Table 7: Frequency of Post-operative complication in emergency laparotomy in SPHMMC, 2018.....	20
Table 8: <i>Outcome of emergency laparotomy with sex distribution in SPHMMC, 2018.....</i>	21
Table 9: Number of deaths in relation with intraoperative diagnosis in emergency laparotomy at SPHMMC, 2018	22
Table 10: The relationship between duration of illness and mortality in emergency laparotomy at SPHMMC, 2018	22
Table 11: The relationship between post op stay and mortality in emergency laparotomy at SPHMMC, 2018	22
Table 12: Immediate cause of deaths in emergency laparotomy at SPHMMC, 2018	23
Table 13: Association of variables of post-operative complication at bivariate analysis in SPMMC, 2018	23
Table 14 : Adjusted multivariate analyses of categorical predictor variables that correlated with post-operative complication following emergency laparotomy at SPHMMC, 2018.....	24
Table 15: Unadjusted bivariate analyses of categorical predictor variables that correlated with 30-day mortality following emergency laparotomy at SPHMMC, 2018.....	25
Table 16: Adjusted multivariate analyses of categorical predictor variables that correlated with 30-day mortality following emergency laparotomy at SPHMMC, 2018.....	26
Figure 1: Age and sex distribution of patients with emergency laparotomy at SPHMMC, 2018.....	16
Figure 2: Frequency of patients operated as emergency laparotomy admission by Unit at SPHMMC, 2018	17

ACRONYMS AND ABBREVIATIONS

AA	Addis Ababa
AOR	Adjusted Odd Ratio
BP	Blood Pressure
CI	Confidence Interval
COR	Crude Odds Ratio
EGS/ES	Emergency General surgery/Emergency Surgery
GI	Gastro Intestinal
GP	General Practitioner
HICs	High Income Countries
HDI	Human Development Index
ICU	Intensive Care Unit
IRB	Institutional Review Board
LBO	Large Bowel Obstruction
LMICs	Low Middle Income Countries
POM	Perioperative Mortality
PPUD	Perforated Peptic Ulcer Disease
SBO	Small Bowel Obstruction
SPHMMC	Saint Paul's Hospital Millennium Medical College
SPSS	Statistical Package for Social Science
WHO	World Health Organization

Operational definition

- **Emergency surgery:** An acute specialty of surgery where decisions often need to be made urgently to treat trauma or acute illness subsequent to an emergency presentation.
- **Emergency laparotomy:** Is a major operation that involves opening the abdomen (tummy) which allows viewing the organs inside and repairing any emergency problems that have occurred.
- ***Postoperative morbidity:*** was used for the complications that prolonged the hospital stay and required additional treatment or intervention to the patients, within one month postoperatively.
- ***Postoperative mortality:*** was defined as the death within the one month after operation.
- ***Viscous perforation:*** Perforation of gastrointestinal tract from Stomach to rectum excluding perforated peptic ulcer disease.

1. INTRODUCTION

1.1 BACKGROUND

Emergency surgery deals with acutely life-threatening conditions caused by external trauma, acute disease processes or surgical complications. It includes unplanned surgery for admitted patients and unplanned surgery for patients already awaiting an elective surgery procedure (for example, in cases of acute deterioration of an existing condition). These patients need urgent decision-making often followed by surgical, radiological or endoscopic interventions. The degree of physiological derangement determines the type and urgency of intervention, and delays of hours or even minutes are critical determinants of outcome. A standard approach to ES patients provides a framework upon which to base resuscitation, investigations and management decisions. Communication is a key part in the acute management of these patients as many people are involved [1, 2].

Emergency surgery is considered to be unplanned in its nature and may extend for up to 10 days from the time a decision for surgery is made. The extended time period of up to 10 days accommodates those patients who require emergency surgery but who cannot be operated on for clinical reasons (e.g. until swelling has reduced). Surgery scheduled beyond 10 days is considered to be planned in nature, be initial or staged procedure, and therefore is considered elective surgery [3].

Acute abdomen is the most common surgical emergency. It has been estimated that at least 50% of general surgical admissions are emergencies and 50% of them present with acute abdominal pain [4].

An emergency laparotomy is a major operation that involves opening the abdomen (tummy) which allows the surgeon to view the organs inside and repair any emergency problems that have occurred. It is a standard of acute abdominal surgery (including for traumatic injuries, a leading cause of death in young people around the world and is the most invasive procedure with the highest side effect profile. These may be performed for a variety of conditions, including complications of elective (planned) surgery. Outcomes of Emergency Surgery represents an internationally important marker of healthcare quality and capacity [5, 6].

Outcome of surgery refers to the patient's subsequent health status (including mortality, morbidity and quality of life). Surgical procedures have major physical, psychological and social impacts on patients and consume significant resources. The goals of surgical intervention are to increase length (e.g. cancer surgery) or quality of life (e.g. joint replacement surgery). However the tissue trauma related to surgical procedures and the associated physiological disturbance of anesthesia and other perioperative interventions may cause significant harm to some patients: surgery (and particularly major surgery) is associated with a significant risk of death or other adverse outcome [7].

Outcome following surgery is a significant public health issue. Data published in a recent study sponsored by the World Health Organization (WHO) suggest that more than 234.2 (95% CI 187.2—281.2) million major surgical procedures are undertaken every year worldwide [8].

Emergency surgery including laparotomy is associated with significantly increased postoperative morbidity and mortality when compared with the elective ones. Murtaza B., et al showed that postoperative complications were seen in emergency laparotomy was 33.7%, while in elective laparotomy was 14.2%. Postoperative fever, wound infection, nausea and vomiting are the mostly encountered complications [9].

“Postoperative morbidity”, is used for the complications that prolonged the hospital stay and required additional treatment or intervention to the patients, within one month postoperatively. Adverse patient outcomes after emergency laparotomy (such as death and complications) may result from pre-existing health conditions of the patient having surgery, the nature of the surgery, or a variety of factors that affect the quality of care administered [10].

The Perioperative Mortality (*POM*) is defined as death following surgery and anesthesia within two time periods: on the day of surgery (including death in the operating theatre) and before discharge from hospital or within 30 days of surgery, whichever is sooner [11].

Death before discharge from hospital was chosen rather than within 30 days because of the challenge of following up patients after discharge in many parts of the world, particularly in developing countries whose hospitals serve remote and rural village populations. However, for a credible indicator at the population level, many LMICs would struggle to report 30-day mortality. For these reasons we believe that POM 30 should be the term used, but that death

before discharge was used as a proxy for 30-day mortality where 30-day mortality rates are not currently feasible [12, 13].

Mortality in emergency major GI surgical patients remains high. Failure to allocate patients to the appropriate level of care immediately after surgery may contribute to the high postoperative mortality [10].

According to the report of Ethiopia Services Availability and Readiness Assessment for Hospitals in 2016, which was directed only for hospitals showed that; laparotomy was the second widely available service (88 %) preceded by Episiotomy (91 %) [14].

1.2 STATEMENT OF PROBLEM

Surgical disease is inadequately addressed globally, and emergency conditions requiring surgery contribute substantially to the global disease burden [15].

In the index year of 2010, there were 896000 deaths, 20 million years of life lost and 25 million disability-adjusted life-years from 11 emergency general surgical conditions reported individually in the Global Burden of Disease Study. The most common cause of death was complicated peptic ulcer disease, followed by aortic aneurysm, bowel obstruction, biliary disease, mesenteric ischemia, peripheral vascular disease, abscess and soft tissue infections, and appendicitis. The mortality rate was higher in high-income countries (HICs) than in low- and middle-income countries (LMICs) (24.3 versus 10.6 deaths per 100000 inhabitants respectively), primarily owed to a higher rate of vascular disease in HICs. However, because of the much larger population, 70 per cent of deaths occurred in LMICs. Deaths from vascular disease rose from 15 to 25 per cent of surgical emergency-related deaths in LMICs (from 1990 to 2010). Surgical capacity to address this burden is suboptimal in LMICs, with less than one operating theatre per 100000 inhabitants in many LMICs, whereas some HICs have more than 14 per 100000 inhabitants [16].

Despite the burden of disease, two billion people, namely those living below the poverty line in low- and middle-income countries (LMICs), continue to lack access to surgical care. This is particularly important to people requiring emergency surgery, because minutes or hours of delay before treatment have a profound impact on potential disability and chance of survival [17].

An increased knowledge about disease burden for surgical emergencies may be useful for both the surgical and public health communities in planning a more adequate response. Emergency laparotomies are performed commonly throughout the world, but one in six patients die within a month of surgery. Current international initiatives to reduce the considerable associated morbidity and mortality are founded upon delivering individualized perioperative care. However, while the identification of high-risk patients requires the routine assessment of individual risk, no method of doing so has been demonstrated to be practical and reliable across the commonly encountered spectrum of presentations, co-morbidities and operative procedures [18].

Emergency laparotomy for peritonitis, bowel obstruction and other abdominal catastrophes is a relatively modest part of emergency general surgery (about 10% of caseload) but carries a sizeable mortality (average 15%) even higher risks in the elderly and comorbid, causes complications in over 50% of cases and consumes enormous resource, being the largest single user of ICU beds[19,20].

According to a research done by the American College of Surgeons National Surgical Quality Improvement Program database (2005 to 2009), there were 37,553 patients who had undergone emergency laparotomy, with a 14% mortality rate [21].

The Post-Operative Complication Rate (POCR) and post-operative Mortality rate (POMR) observed in sub-Saharan countries ranged from 14-33% complications rates and 10-30% mortality rates in laparotomy [22].

As research done in Gondar University Hospital, Ethiopia in 2007 more than 1 in 10 operations done were for acute abdomen. Nearly a quarter of the operations performed in the study period were laparotomies, 43.3% of which were on emergency bases [23].

2. LITERATURE REVIEW

A research done on determinants of morbidity and mortality following emergency abdominal surgery in children in low-income and middle-income countries in 2016, showed that child mortality at 30 days was significantly higher in low-Human Development Index (HDI) (adjusted OR 7.14 (95% CI 2.52 to 20.23), $p < 0.001$) and middle-HDI (4.42 (1.44 to 13.56), $p = 0.009$) countries compared with high-HDI countries, translating to 40 excess deaths per 1000 procedures performed. Overall, 30-day mortality following surgery was 2.9% ($n = 41/1409$). The overall rate of major complications following emergency abdominal surgery was 7.2% ($n = 102/1409$). Major complications were significantly more common in low-HDI countries (11.3%, 30/265) compared with middle-HDI and high-HDI countries (6.4%, 29/450 and 6.2% 43/694, respectively, $p = 0.017$) [24].

A study done in Denmark in 2013 on Mortality and postoperative care path ways after emergency gastrointestinal surgery showed total of 538 patients [18.5%, 95% confidence interval (CI): 17.1–19.9] died within 30 days of surgery. In all, 84.2% of the patients were treated after operation in the standard ward, with a 30 day mortality of 14.3%, and 4.8% were admitted to the intensive care unit (ICU) after a median stay of 2 days (inter-quartile range: 1–6). When compared with ‘admission to standard ward’, ‘admission to standard ward before ICU admission’ and ‘ICU admission after surgery’ were independently associated with 30 day mortality; odds ratio 5.45 (95% CI: 3.48–8.56) and 3.27 (95% CI: 2.45–4.36), respectively[10].

As the first patient report of the national emergency laparotomy audit done in UK Hospitals in 2015 showed more than 30,000 patients undergo an emergency laparotomy each year. These procedures are associated with high rates of postoperative complications and death; recent studies have reported that overall 15% of patients die within one month of having an emergency laparotomy but that this rate varies between hospitals and patient groups. Thirty-day inpatient mortality was 11%. The time that patients spent in hospital after surgery who survived to leave hospital were in hospital for less than 12 days after surgery, more than a quarter had yet to leave 20 days after surgery. Mortality following emergency bowel surgery is up to five times greater than that seen in patients undergoing major elective surgery (cardiac, cancer, vascular). Almost half of patients undergoing emergency laparotomy were over 70 years of age. One in five

patients over the age of 70 died within 30 days of surgery, making their mortality rate six times greater than that of patients aged 50 and under. They also had a longer length of stay [10].

As research done in Royal United Hospital, Bath, UK in 2012, on Postoperative morbidity survey, mortality and length of stay following emergency laparotomy showed that thirty -day mortality following emergency laparotomy is high, and greater amongst elderly patients. Cumulative postoperative morbidity survey scores and patterns of morbidity were similar ($p = 0.454$); however, 28-day mortality was higher in the elderly (10/30 (33.3%) vs 11/114 (9.6%), $p = 0.008$), and hospital stay was longer (median (IQR [range]) 17 (13–35 [6–62]) days vs. 11 (7–21 [2–159]) days, ($p = 0.006$). Regression analysis indicated that cardiovascular, hematological, renal and wound complications were associated with longer hospital stay, and that cardiovascular complications predicted mortality [25].

A research which was done at Oncology Training and Research Hospital, Ankara, Turkey in 2015, on factors affecting postoperative morbidity and mortality in Obstructing Colorectal Cancer, Postoperative morbidity was developed in 16 (37.6%) patients while mortality was seen in 8 (18.6%) patients during the postoperative period. Sixteen (37.6%) patients developed at least one complication during the postoperative period of one month. Among those, wound infection was the most common ($n=9$) complication. Anastomotic leak ($n=3$), evisceration ($n=2$), intraabdominal hemorrhage ($n=1$), and intraabdominal abscess ($n=1$) were the other causes of postoperative morbidity. The median age of the patients who had postoperative morbidity (68.7 years) was higher than the all patients' median age (63.8%) [26].

Postoperative mortality was seen in eight (18.6%) cases. These patients had a median age of 70, which was higher than the median age of study population. Additionally, all the patients who died within the one month after surgery were graded as ASA 3 or 4. Advanced tumor stage ($p=0.040$), and high ASA score ($p=0.000$) were found to be associated with the development of postoperative morbidity. Two-step surgery was the most performed surgical procedure (21, 48.8%) in the patients. Age above 65 years ($p=0.023$), accompanying systemic disease ($p=0.014$), high ASA score ($p=0.010$), and presence of distant metastasis ($p=0.012$) were the risk factors associated with postoperative mortality in univariate analysis [26].

As study done in in 2008 from The American College of Surgeons' National Surgical Quality Improvement Program database on *Preoperative anemia and postoperative outcomes in non-*

cardiac surgery, postoperative mortality at 30 days was higher in patients with anemia than in those without anemia (odds ratio [OR] 1.42, 95% CI 1.31–1.54); the difference was consistent in mild anemia (1.41, 1.30–1.53) and moderate-to-severe anemia (1.44, 1.29–1.60). Composite postoperative morbidity at 30 days was also higher in patients with anemia than in those without anemia (adjusted OR 1.35, 1.30–1.40), again consistent in patients with mild anemia (1.31, 1.26–1.36) and moderate-to-severe anemia (1.56, 1.47–1.66). When compared with patients without anemia or a defined risk factor, patients with anemia and most risk factors had a higher adjusted OR for 30-day mortality and morbidity than did patients with either anemia or the risk factor alone[27].

According to a research done on outcomes and predictors of mortality following emergency laparotomy in 2012 IN United Kingdom teaching Hospitals, showed that among who underwent emergency laparotomy Sepsis (pneumonia [21 %], wound infection [20 %], bacteremia [14 %]), cardiac (24 %) and respiratory failure (21 %) were the most common postoperative morbidities encountered. Overall mortality at 30 days, hospital discharge, 12-month, and 24-months postoperatively was 14, 16.5, 22.4, and 25.9 %, respectively. Age ≥ 70 years (odds ratio [OR] = 9.2, P = 0.004) and a need for postoperative ICU/HDU (OR = 15.0, P = 0.014) were independent predictors of 30-day mortality. Independent predictors of in-hospital mortality were age ≥ 70 years (OR = 18.2, P = 0.016), ASA CIII (OR = 22.1, P = 0.034), preoperative sepsis (OR = 20.6, P = 0.045), and need for postoperative ICU/HDU (OR = 21.5, P = 0.038) [28].

According to a research done by the American College of Surgeons National Surgical Quality Improvement Program database (2005 to 2009), there were 37,553 patients who had undergone emergency laparotomy, with a 14% mortality rate. The American Society of Anesthesiologists classification system, functional status, sepsis, and age were the variables most significantly associated with mortality. Patients older than 90 years of age, with an American Society of Anesthesiologists class V, septic shock, dependent functional status, and abnormal white blood cell count have a 10% probability of survival [21].

A research done in the *Department of Surgery, Mamata Medical College, Khammam, Telangana, India* showed the most common co-morbidities and risk factors were smoking (36.4%), hypertension (31.8%) and diabetes mellitus (28.8%). Hypertension, diabetes mellitus, renal failure were highly significant ($p < 0.001$) for major complications. The rate of occurrence

of major complications increased as the number of preoperative co-morbidities increased among patients. Patients with 5 co-morbidities had 5-fold increases in complication rate compared to patients with single co-morbidity (100% vs. 20%). Most common major complication were pulmonary diseases (34.8%) including pneumonia (19.7%), prolonged ventilation (12.1%), pulmonary embolism (3%), followed by deep vein thrombosis, acute renal failure, wound disruption, sepsis and shock [29].

A research done in South Africa in 2014, on outcome of trauma laparotomy showed among 118 patients who were admitted to trauma surgery ward seventy patients (59.3%) were managed conservatively. Forty-eight patients (40.7%) required surgery, 101 (85.6%) were penetrating [stab wounds in 67 (56.8%) and gunshot in 34 (28.8%)], and 17 (14.4%) with blunt injuries. A total of 48 index laparotomies were done during this period, of which 13(27.1%) patients developed postoperative complications. The median hospital stay for all patients was 6 days (IQR4–11). The median length of stay was significantly longer in patients who developed postoperative complications than in those who did not [16 (IQR 10–20) d vs. 5 (IQR 4–7) d, $p < 0.01$]. Only 1 patient (0.8%) died the median RT of the EMS after contact was 53 min for patients who developed complications. It was significantly longer than for those without complications, 21 min ($p < 0.01$).The median delay to laparotomies from injury for patients with postoperative complications was 10.3 hours and for those without complications was 7.5 hours. The delay from injury to the theatre was also a significant factor in the development of complications ($p = 0.02$) [30].

A study done on outcome of emergency surgical operations performed for nontraumatic acute abdomen among adults in Mekele hospital, Tigray, Ethiopia, in 2013 showed that, there was two hundred fifty five cases; the mean age was 36.7 years. Abdominal pain 255(100%) and vomiting 204 (80%) were the most frequent symptoms. One hundred two (40%) of the cases presented their complaint 1 -2 days of symptoms and the most common preoperative and operative diagnosis of non-traumatic acute abdomen were acute appendicitis 51.4%, and 50.2% respectively. Wound infection was the most common post-operative complication. The odds of postoperative complication was higher among Patients older than 55 years (AOR: 3.218; 95% CI: 1.174, 8.818) as compared with relatively young age group 15-25 Years. Similarly, those

Patients who were present more than 2 days; complaints were associated with postoperative complication (AOR: 0.277; 95% CI: 0.107, 0.726) [31].

The mortality rate following acute abdominal surgical emergencies is still high. The overall mortality was 4.2% and the rate increased significantly in patients aged >60 years. Postoperative mortality was 5.8% while mortality rate in non-operated patients was 2.8%. The causes of preoperative death included perforated peptic ulcer, abdominal malignancies (15.4%) and urgent colonic resections (9.4%). Emergency procedures generally are associated with increased morbidity and mortality rate in elderly patients (the overall mortality was 22%) [31, 35].

A study done in Butajira, Ethiopia, in 2009 indicates that among a total of 143 patients; Intestinal obstruction were the leading cause of acute abdomen 50 (34.9%), acute appendicitis the second common cause 35 (24.5%). Patients who presented early and immediate corrective measures were instituted had better outcome while those seen late developed unfavorable out-come with significantly higher complications [32].

A study done in Nekemte, Ethiopia on Outcome of Non-Traumatic Surgical Acute Abdomen, in 2013 showed that acute appendicitis was the leading 74(52.8%), Small bowel obstruction was the leading cause of bowel obstruction which accounts 75(63.5%), and there were 107 cases that developed peritonitis. Wound infection was the commonest post-operative complication of appendicitis 14(10%) followed by pneumonia 3(2.1%) and sepsis 1 (0.7%) from total appendicitis cases there were 3(2.2%) deaths of these 66.6% were from age group of >60 years and those who came after 7 day. Wound infection (4), leak (4) and sepsis (2) were the main early post-operative complications in SBO. There were 2(2.7%) deaths of which 1(4.7%) was from nonviable SBO and 1(1.8%) from viable SBO. Wound infection, sepsis, pneumonia accounts 2 in each equally. There were 2 deaths (4.65%) all of were after Hartman's colostomy done and from rural in LBO. The total deaths among patients who had peritonitis at time of operation were six (5.6%) [33].

A study done in Tikur Anbessa Hospital, Ethiopia in 2007 showed there were 214 (36.4%) laparotomies for acute abdomen among 587 adult surgical emergency operations. Acute appendicitis accounting for 52% of cases was the leading cause of acute abdomen followed by intestinal obstruction (26%) and perforated Peptic ulcer disease (PPUD) (9%). There were 36 deaths giving an overall mortality rate of 15.3%. Of the 214 patients who were operated, 30 died

postoperatively accounting for an operative mortality rate of 14%.The mortality rate of 21.2% for small bowel obstruction, 35.2% of sigmoid volvulus and 28.5% of PPUD is very high. A higher mortality rate was observed in patients who presented late. There were 60(28%) cases that developed post-operative complications. Sepsis was the most frequently identified complication in 25 (12%) followed by wound infection in 19 (9%) and pneumonia in 6 (3%) [34].

As research done in Gondar University Hospital, Ethiopia in 2007, more than 1 in 10 operations done were for acute abdomen. Nearly a quarter of the operations performed in the study period were laparotomies, 43.3% of which were on emergency bases. The leading operative diagnoses were small bowel obstruction (SBO), appendicitis and large bowel obstruction (LBO).Seventy-seven (26.6%) of operated patients had early (in-hospital) postoperative complications. The median first postoperative complication detection time was the fourth postoperative day. The median hospital stay was 8 days. Seventy seven (55.6%) of the patients among those with less than 72 hours presentation-time stayed for 8 days or less in hospital. However, 66 (66.7%) of patients with presentation time longer than 72 hours stayed more than 8 days in Hospital. Twenty-seven of the patients (9.3%), twenty males and seven females, died. The average hospital stay of patients who died was 5.7 days. The median was 3 days. The mean age of patients who died was 41.5, and the median was 45. Ninety-eight patients (33.3%) had follow-up after discharge from hospital. Fourteen had developed long-term complications. Incisional hernia was the commonest complication found in those patients with long-term follow up [23].

3. OBJECTIVE

3.1 General Objective

To determine morbidity, mortality and associated factors in patients for whom emergency laparotomy was done in SPHMMC surgical ward, Addis Ababa, Ethiopia, 2018

3.2 Specific Objectives

To describe the morbidity and mortality pattern of emergency laparotomy patients.

To identify factors associated with morbidity and mortality in laparotomy patients.

4. METHODS AND MATERIALS

4.1 Study area

The study was conducted at St Paul's Hospital Millennium Medical College (SPHMMC) which is located in Addis Ababa, Ethiopia. The college initiated Ethiopia's first integrated modular and hybrid problem based curriculum for its undergraduate medical education, and is currently expanding to postgraduate programs and diversifying its undergraduate program. SPHMMC is the second big hospital in A.A which serves as a referral center for patients from Addis Ababa and all over the country. The college has more than 2800 clinical, academic and administrative and support staffs that provide medical specialty services to patients who are referred from all over the country, teaching medicine and nursing students and doing basic and applied researches. While the inpatient capacity is more than 350 beds, the college sees an average of 1200 emergencies and outpatient clients daily. On average it provides health service for 16000 inpatients and 300,000 outpatients and 5000 surgeries annually.

The Hospital has been giving surgical care since its establishment. Currently the department of surgery gives services of emergency and elective surgery for general, pediatrics, urology surgeries with 110 beds, 4 major operation rooms and 6 ICU beds sharing with other two departments'. Treatment providers include one pediatric surgeon, more than 20 general surgeons, 5 urology surgeons and 15 Senior Residents (year 3 and 4) and 41 Junior Residents (year 1 and 2).

4.2 Study Design and period

One year, an institution based retrospective record review design was conducted From *October /2017 - August /2018*.

4.3 Populations

4.3.1 Source Population

All emergency surgical patients admitted to surgical wards of SPHMMC during the study period.

4.3.2 Study population

All Patients admitted to surgical ward as emergency and for whom emergency laparotomy was done during the study period

4.4 Inclusion and exclusion criteria

4.4.1 Inclusion Criteria

All patients undergoing emergency laparotomy will be included.

4.4.2 Exclusion criteria

Patients who were operated and referred after operation from other health institution.

Patients whose chart had incomplete information.

Patients operated additionally for other diagnosis.

4.5 Sample size determination, sampling technique and sampling procedure

4.5.1 Sample size determination

All patients with emergency laparotomy in the study period was included in the study.

4.6 Variables

4.6.1 Dependent Variable

Morbidity and Mortality

4.6.2 Independent variables

4.6.2.1 Sociodemographic factors

- Age
- Sex
- Address
- Educational level
- Occupation

4.6.2.2 Clinical

- Diagnosis
- Duration of illness
- Duration of operation
- Vital sign at presentation
- Pre op stay
- Post op stay
- Accompanying systemic diseases (Comorbidity)

4.7 Data collection and procedure

4.7.1 Data collection tool and methods

A pretested questionnaire administered data collection was used. The Questionnaire was adopted from different literature consisting of the following parts. It had different parts including socio-demographic, morbidity type, common emergency cases, length of Stay, and morbidity categorization by diagnosis. Study subjects was identified from the hospital log books (admission, discharge and operation) and individual patient charts was reviewed for the study variables such as: Admission date, confirmed diagnosis, vital sign at presentation, result of investigations, duration of operation, types of surgery, ICU admission, Patient status during admission and after treatment, transferred to other wards, number of patients died, type of care or medical treatment given. The questionnaire was prepared in English.

4.7.2 Data collectors, supervisors and collection procedure

Three interns for data collection and two GP for supervisor was selected. One day training on questionnaires and method of study was given for them to improve the quality of data. All the daily activities was communicated to the supervisors and they had a responsibility to control,

organize and lead the entire data collection phase. The principal investigator supervised the overall activities carried during the data collection time.

4.8 Data quality assurance

Daily checking the collected data was done along with discussion led by the supervisors to keep the data consistent and complete.

4.9 Data processing, interpretation and analysis

The collected data was cleaned, coded and entered and into SPSS version 23 for analysis. Descriptive statistics like frequency, mean/median, standard deviation and percentage was used. The result was summarized using graphs, charts and tables. The interpretation of data using summaries was done according to the main finding in the study objective.

Binary logistic regression was used to identify factors of morbidity and mortality. Explanatory variables with level of significance less than 0.25 was used to select independent variables appeared on bivariate analysis for fit for the final multiple logistic regression model. Variables appeared on multiple logistic regressions with p-value less than 0.05 was declared as statistically significant.

4.10 Ethical consideration

The study was conducted after ethical clearance is obtained from the college institutional review board (IRB).

4.11 Dissemination of the results

The results of the study will be disseminated to SPMMC department of surgery and other bodies who need the research accordingly. The paper will also be submitted to national or international peer reviewed scientific journals for possible publication.

4.12 limitation of study

- Missed chart of patient from record store

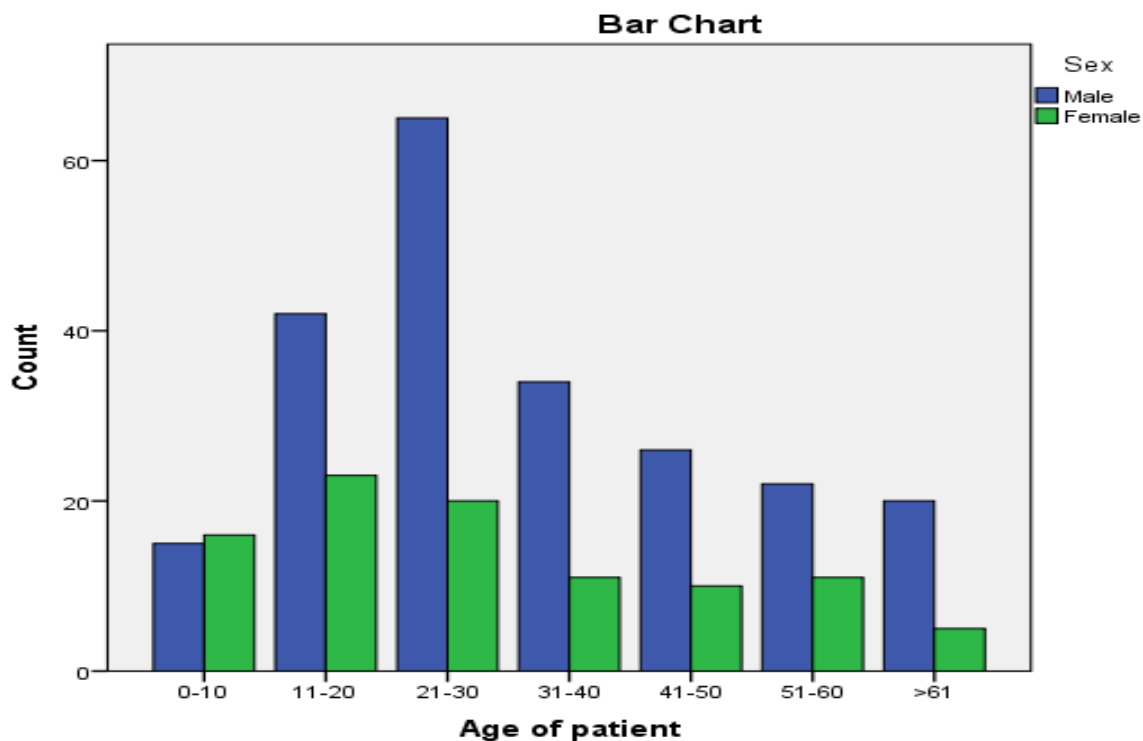
- Incomplete documentation information on the chart (variables, morbidity, mortality)

- Small sample size

5. Results

A total of 390 emergency laparotomies were performed during the study period. Among those the records of 320 patients were retrieved for analysis making a retrieval rate of 82.01%. The Age of patients' ranges from 1-86 years and the mean age was 32.5 years and the majority of cases (46.9%) were aged between 11 and 30 years. Of the 320 patients, 224(70%) were male and 96 (30%) were females (M: F=2.3:1). One hundred ninety two (60%) were from outside of Addis Ababa and 128 (40%) were from Addis Ababa.

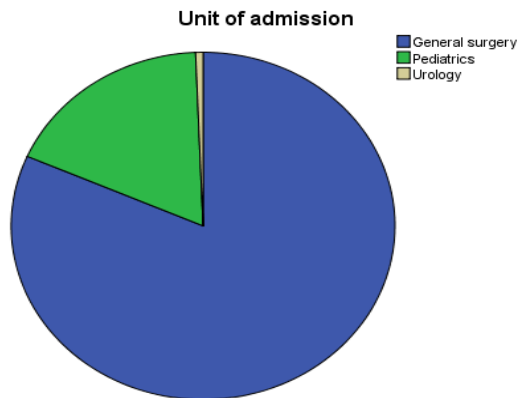
Figure 1: Age and sex distribution of patients with emergency laparotomy at SPHMMC, 2018



Majority of patients 298(93.1%) had no history of recorded comorbid illness and only 22(6.9%) had history of comorbid illness. Among whom had comorbid illness, Retroviral Infection (RVI) and Diabetes Mellitus are the commonest of each accounts 6 (27.27%).

Of the 320 patients, 261 (81.6%) were admitted to general surgery department, 57 (17.8%) were to pediatrics and only 2 (0.6%) were admitted to urology surgery.

Figure 2: Frequency of patients operated as emergency laparotomy admission by Unit at SPHMMC, 2018



In 114(35.6%) of cases, the time interval between an onset of symptoms and presentation to hospital was 25 to 72 hours. 111(34.7%) presented in the first 24 hours of symptoms and 95 (29.7%) presented after 72 hours onset of symptoms. Ninety-five of the patients (29.7%) had longer than 72 hours duration of presenting complaint, 43 (37.4%) of which developed postoperative complication. Two hundred and twenty five (70.3%) of the patients came to hospital earlier than 72 hours, and only 72(22.5%) of them developed postoperative complications.

Table 1: Durations of symptoms patients operated as emergency laparotomy in SPHMMC, 2018

S.N	Duration of illness	Number of patients	Percent
1	<=24	111	34.7
2	25-72 hours	114	35.6
3	>72 hours	95	29.7
	Total	320	100.0

As is shown in Table 2, the most common indication of emergency laparotomy was peritonitis 145(45.3%), followed by small bowel obstruction 66(20.6%) and large bowel obstruction 44(13.8%).

Table 2: The frequency and indication of emergency laparotomy in SPHMMC, 2018

S. No	Indication	Frequency	Percent
1	Peritonitis	145	45.3
2	Small Bowel Obstruction	66	20.6
3	Large bowel obstruction	44	13.8
4	Penetrating Abdominal trauma	40	12.5
	1 Stab Abdominal Trauma	22	6.3
	2 Bullet Abdominal trauma	18	5.6
4	Blunt Abdominal trauma	20	6.9
5	others*	5	1.6
	Total	320	100.0

Perforated appendicitis accounted 79(24.7%) of intraoperative finding of whom 42 (53.2%) were males and 37 (46.8%) were females (M: F =1.13:1) and, followed by viscous perforation (other than perforated PUD) 48(15%) and perforated PUD 36(11.3%).

Table 3: Operative diagnosis of patients who underwent emergency laparotomy in SPHMMC, 2018

No	Intraoperative Diagnosis	Frequency	Percent
1	Perforated Appendicitis	79	24.7
2	viscous perforation(other than PPUD)	48	15.0
3	Perforated PUD	36	11.3
4	Small bowel volvulus	26	8.1
5	GI tumor	19	5.9
6	Post op adhesion	16	5.0
7	Gangrenous sigmoid volvulus	15	4.7
8	solid organ injury	13	4.1
9	Abdominal abscess	10	3.1
10	Intussusception	9	2.8
11	Ileosigmoid knotting	9	2.8
12	Viable Sigmoid volvulus	8	2.5
13	Mesenteric vascular occlusion	6	1.9
14	Tuberculosis peritonitis	6	1.9
15	Hem peritoneum	6	1.9
16	others	14	4.4
	Total	320	100.0

Of the 320 patients, the three most frequent procedures were Appendectomy and lavage (82; 25.6%), resection and primary anastomosis (42; 13.1%) and repair of perforated peptic ulcer diseases (36; 11.3%).

Table 4: Frequency of types of surgery done in emergency laparotomy in SPHMMC, 2018

No	Types of Surgery	Frequency	Percent
1	Appendectomy and lavage	82	25.6
2	Resection and primary anastomosis	42	13.1
3	Peptic ulcer (suture or repair of perforation)	36	11.3
4	Colectomy and Hartman's procedure	30	9.4
5	Derotation	25	7.8
6	Adhesiolysis/release	14	4.4
7	Repair of intestinal perforation	12	3.8
8	Homeostasis	11	3.4
9	Loop colostomy	10	3.1
10	Lavage	9	2.8
11	Right hemi colectomy	7	2.2
12	Biopsy	7	2.2
15	Abdominal closure	5	1.6
16	Stomach repair	5	1.6
17	Milking	5	1.6
18	Others *	20	6.25
	Total	320	100.0

*Splenic repair-4, Drainage of abscess/collection-3, Splenectomy-3, Liver repair-2, Bladder repair-2, Ileostomy-2, Ileotransverse anastomosis-2, Stoma revision-1, Partial cholecystectomy-1

Majority of operations 80(25%) were performed within less than 1 hour and followed by 61-90min 70(21.9%), about 35(10.9%) operations were performed within more than 3 hours.

Table 5: Duration of surgery in emergency laparotomy in SPHMMC, in 2018

No	Duration	Frequency	Percent
1	<=60 min	80	25.0
2	61-90 min	70	21.9
3	91-120 min	54	16.9
4	121-150 min	44	13.8
5	151-180 min	37	11.6
6	>181 min	35	10.9
	Total	320	100.0

Majority of our patients 306(95.6%) were managed in general surgical ward while only 14(4.4%) patients managed in the medical ICU post operatively.

Table 6: Postoperative destination following emergency laparotomy in SPHMMC, 2018

No	Post OP destination	Frequency	Percent
1	General surgical ward	306	95.6
2	ICU	14	4.4
	Total	320	100.0

One hundred and fifteen (35.9%) of operated patients had early within 30 days of postoperative complications. Among patients who developed complications 74(23.1%) had only one complication and 33(10.3%) had two and more than two complications. About 11(10.5%) of complication diagnosed at follow up within 30 days of operation. The most common complication was wound infection 42(13.1%), followed by Sepsis 25(7.8%) and pneumonia 21(6.67%).

Table 7: Frequency of Post-operative complication in emergency laparotomy in SPHMMC, 2018

S.N	Complication		Frequency	Percent	One comp	Number	Percent
1		Yes	115	35.9	>=Two comp	74	22.8
		No	215	64.1		33	10.3

2	Complication	1	Wound Infection	42	13.1
		2	Sepsis	25	7.8
		3	Pneumonia	21	6.67
		4	Intraabdominal Abscess	12	3.8
		5	Hypoproteinemia	12	3.8
		6	Wound Dehiscence	10	3.1
		7	Fecal Fistula	10	3.1
		8	Paralytic ileus	9	2.8
		9	Hypokalemia	9	2.8
		10	Others*	18	4.6
		Total		156	100

*AKI-4, Anastomotic leak-3, ARDS -3, PTE-3, Brief Psychotic D/O -3, DVT-2

Overall, 35(10.9%), of the 320 patients, twenty-three males and twelve females, died and accounting for an operative mortality rate of 10.94%. The commonest intraoperative diagnosis cause for death was viscous perforation 8(22.8%) and followed by perforated Peptic ulcer diseases, gangrenous sigmoid volvulus and mesenteric vascular occlusion each accounts 4(11.4%). Majority of patients 15(42.9%) who died were presented to hospital after 72 hours onset of symptoms and about 20 (57.14%) patients died within the first 72 hours of post operation.

Table 8: Outcome of emergency laparotomy with sex distribution in SPHMMC, 2018

		outcome of management		Total
		Improved	Died	
Sex	Male	201	23	224
	Female	84	12	96
Total		285	35	320

Table 9: Number of deaths in relation with intraoperative diagnosis in emergency laparotomy at SPHMMC, 2018

S.N	Intraoperative diagnosis	Death	
		Frequency	Percent
1	Perforated Viscous	8	22.8
2	Perforate PUD	4	11.4
3	Gangrenous sigmoid volvulus	4	11.4
4	Mesenteric vascular occlusion	4	11.4
5	Ileosigmoid knotting	3	8.5
6	Others*	12	34.3
	Total	35	100

*small bowel volvulus=2, Solid organ injury=2, perforated Appendicitis=1, post op adhesion=1, Tb peritonitis=1, hemi peritoneum=1, intraabdominal abscess=1, intussusception=1

Table 10: The relationship between duration of illness and mortality in emergency laparotomy at SPHMMC, 2018

S.N	Duration of illness	All patients	Patients died	%Mortality rate
1	Within 24 hours	111	11	9.9%
2	25-72hours	114	9	7.9%
3	>72 hours	95	15	15.9%
4	Total	320	35	10.9%

Table 11: The relationship between post op stay and mortality in emergency laparotomy at SPHMMC, 2018

S.N	Duration Of Post Op stay	All patients	Patient Died	%Mortality rate
1	<3days	26	20	76.9%
2	3-5days	96	3	3.12%
3	6-7days	83	3	3.6%
4	8-10days	42	3	7.14%
5	11-14days	29	3	10.34%
6	>2weeks	44	3	6.81%
	Total	320	35	10.9%

As shown table below Multiple Organ failure was the commonest immediate cause of death (48.57%) and followed by respiratory failure (28.71%) and Septic shock (17.71%).

Table 12: Immediate cause of deaths in emergency laparotomy at SPHMMC, 2018

S.N	Immediate cause of death	Frequency	Percent
1	MOF	17	48.57
2	Respiratory failure	9	28.71
3	Septic shock	6	17.14
4	Cardiac arrest	3	8.57
	Total	35	100

Table 13: Association of variables of post-operative complication at bivariate analysis in SPMMC, 2018

	Variables	Range of variables	Yes (%)	No (%)	Complication rate	p-value	COR
1	Age of patients	0-10	8(7)	23(11.2)	25.8%	1.00	1.00
		11-20	19(16.5)	46(22.4)	29.2%	0.727	.84(.32,2.2)
		21-30	27(23.5)	58(28.3)	31.8%	0.537	.74(.29,1.88)
		31-40	19(16.5)	26(12.7)	42.2%	0.145	.48(.178,1.29)
		41-50	14(12.2)	22(10.7)	38.9%	0.258	.55(.19,1.56)
		51-60	14(12.2)	19(9.3)	42.4%	0.165	.47(.16,1.36)
		>61	14(12.2)	11(5.4)	56.0%	0.024	.27(.09,.84)
2	Comorbid illness	Yes	15(13)	7(3.4)	68.2%	0.002*	4.243(1.676, 10.741)
		No	100(87)	198(96.6)	33.6%	1.00	1.00
3	Vital sign	WNR	81(70.4)	181(88.3)	30.9%	1.00	1.00
		Systolic BP <90 mmHg	19(16.5)	5(2.4)	79.2%	0.000	.12(.04,.33)
		HR>120	15(13)	19(9.3)	44.1%	.125	.57(.27,1.17)
4	Duration of operation	<60 minute	24(20.9)	56(27.3)	30	1.00	
		61-90 minute	18(15.7)	52(25.4)	25.7	.560	1.24(.6,2.54)
		91-120 minute	20(17.4)	34(16.6)	37	.396	.73(.35,1.51)
		121-150 minute	14(12.2)	30(14.6)	31.8	.834	.92(.42,2.03)

		151-180 minute	17(14.8)	20(9.8)	45.9	.095	.50(.23,1.13)
		>181 minute	22(19.1)	13(6.3)	62.9	.001	.25(.11,.58)
5	Post operation Destination	General surgical ward	102(88.7)	204(99.5)	33.3	1.00	1.00
		ICU	13(11.3)	1(.5)	92.9	.002	.04(.005,.298)
6	Pre operation stay	0 day	76(66.1)	134(65.4)	36.2	1.00	
		1 day	21(18.3)	58(28.30)	26.6	.125	1.57(.88, 2.78)
		>=2day	18(15.7)	13(6.3)	58.1	.023	.41(.19,.88)
7	Post op stay	<3days	19(16.7)	7(3.4)	73.1	.859	1.10(.36, 3.33)
		3-5days	16(14)	80(39)	16.7	.000*	15(6.296,35.74)
		6-7days	14(12.3)	68(33.2)	18.1	.000*	14.57(5.97,35.57)
		8-10days	15(13.2)	27(13.2)	35.7	.000*	5.40(2.13,13.68)
		11-14days	17(14.9)	12(5.9)	58.6	.144	2.12(.77, 5.79)
		>2weeks	33(28.9)	11(5.4)	75	1.00	1.00

Age of patients (>61 years, p=0.024), presence of comorbid illness (p=0.002), systolic BP<90mmhg (p=.000), Duration of operation more than 181minutes (p=0.001), admission to ICU (p=0.002), patients operated after 2 days of admission (p=0.023) and those who are discharged early (p=0.000) are significantly associated with complication of post emergency laparotomy respectively.

Table 14 : Adjusted multivariate analyses of categorical predictor variables that correlated with post-operative complication following emergency laparotomy at SPHMMC, 2018

S.N	Variables	Variables range	yes	no	Complication rate	p-value	AOR
1	Systolic BP	<90mmhg	19(16.5)	5(2.4)	79.2%	0.002	0.158(0.048,0.52)
2	Post op destination	ICU	13(11.3)	1(.5)	92.9%	0.03	0.075(0.007,0.784)
3	Post op stay	3-5days	16(14)	80(39)	16.7%	0.000	11.8(4.09,33.92)
		6-7days	14(12.3)	68(33.2)	18.1%	0.000	11.47(4.01,32.82)
		8-10days	15(13.2)	27(13.2)	35.7%	0.003	5.16(1.67,15.9)

Table 15: Unadjusted bivariate analyses of categorical predictor variables that correlated with 30-day mortality following emergency laparotomy at SPHMMC, 2018

S.N	Variables	Variables range	Improved	Died	Mortality rate	p-value	COR
1	Age of patient	0-10	30(10.5)	1(2.9)	3.2%	1.00	1.00
		11-20	61(21.4)	4(11.4)	6.2%	.553	1.96(.211,18.38)
		21-30	79(27.7)	6(17.1)	7.1%	.455	2.29(.263,19.72)
		31-40	37(13)	8(22.9)	17.8%	.086	6.49(.768,54.79)
		41-50	34(11.9)	2(5.7)	5.6%	.650	1.77(.152,20.45)
		51-60	26(9.1)	7(20.0)	21.2%	.058	8.07(.931,70.04)
		>61	18(6.3)	7(20.0)	28%	.027*	11.67(1.33,102.72)
2	Comorbid illness	Yes	15(5.3)	7(20.0)	31.8%	.003*	4.5(1.69,11.97)
		No	270(94.7)	28(80)	9.4%	1.00	1.00
3	Vital sign at presentation	WNR	244(85.6)	18(51.4)	6.9%	1.00	1.00
		BP <90mmhg	13(4.6)	11(31.4)	45.8%	.000*	11.47(4.50,29.21)
		PR>120/min	28(9.8)	6(17.1)	17.6%	.037*	2.91(1.067,7.92)
4	Duration of operation	<60 minute	73(25.6)	7(20)	8.8%	1.00	1.00
		61-90 minute	65(22.8)	5(14.3)	7.1%	.718	.80(.24,2.65)
		91-120 minute	52(18.2)	2(5.7)	3.7%	.266	.40(.08,2.01)
		121-150 minute	37(13)	7(20)	15.9%	.234	1.97(.64,6.05)
		151-180 minute	32(11.2)	5(14.3)	13.5%	.433	1.63(.48,5.52)
		>181 minute	26(9.1)	9(25.7)	25.7%	.020*	3.61(1.22,10.68)
5	Post Op destination	General surgical ward	275(96.5)	31(88.6)	10.1%	1.00	1.00
		ICU	10(3.5)	4(11.4)	28.6%	.041*	3.55(1.05,11.99)

6	Pre operation stay	0 day	186(65.3)	24(8.6)	11.4%	1.00	1.00
		1 day	76(26.7)	3(8.6)	3.8%	.059	.31(.09,1.05)
		>=2day	27(8.1)	8(22.9)	25.8%	.033*	2.69(1.09,6.69)
7	Post Op complication	Yes	83(29.1)	32(91.4)	27.8%	.000	25.96(7.73,87.12)
		No	202(70.9)	3(8.6)	1.5%	1.00	1.00

As finding of this study age of patients (>61 years, p=.027), presence of comorbid illness (p=.003), vital sign at presentation (systolic BP<90mmhg, p=.000,PR>120, p=.037), duration of operation (more than 181min, p=.020), admission to ICU(p=.041),pre op stay more than 2 days(p=0.000) and having complication post operatively (p=0.000) are significantly associated with mortality of post emergency laparotomy.

Table 16: Adjusted multivariate analyses of categorical predictor variables that correlated with 30-day mortality following emergency laparotomy at SPHMMC, 2018

S.N	Variables	Variables range	Improved	Died	Mortality rate	p-value	AOR
1	Age of patient	>61 years	18(6.3)	7(20.0)	28%	.037	20.28(1.20,341.8)
2	Comorbid illness	yes	15(5.3)	7(20.0)	31.8%	.016	10.47(1.56,70.47)
3	Vital sign at presentation	BP <90mmhg	13(4.6)	11(31.4)	45.8%	.000	26.73(4.30,166.07)
4	Complication	Yes	83(29.1)	32(91.4)	27.8%	.000	29.76(6.90,128.29)

As finding of this study age of patient more than 61, having comorbid illness, vital sign at presentation (systolic BP, <90mmhg) and having complication post operatively are significantly associated with mortality of post emergency laparotomy.

5.1 Discussion

Although laparotomy was the second widely available service (88 %) in Ethiopia and although there were few studies done on the general pattern of an acute abdomen, I didn't found studies done on outcome of emergency laparotomy in the country so far.[14]

A total of 390 emergency laparotomies' were performed in one year from the beginning of September 2016 to the end of August 2017. Of the 390 operated cases, 320 (82.01%) charts of patients fulfill inclusion criteria to be included in the study. The Age of patients' ranges from 1-86 years and the mean age was 32.5 years and the majority of cases (46.9%) were aged between 11 and 30 years. One hundred ninety-two (60%) were from outside of Addis Ababa and 128 (40%) were from Addis Ababa. This is the reverse of study done in Tikur Anbessa for an acute abdomen where majority 153 (66%) came from Addis Ababa (A.A) and 78 (34%) were from outside A.A. [34]

Peritonitis 145(45.3%), small bowel obstruction 66(20.6%) and large bowel obstruction 44(13.8%) were the commonest three indications for an emergency laparotomy. Perforated appendicitis 79(24.7%), viscous perforation 48(15%) and perforated PUD 36(11.3%) were the three commonest intra-operative diagnosis. In a study done in Gonder, Small bowel obstruction (43.4%), acute appendicitis (34.6%) and large bowel obstruction (11.5%) were the commonest three indications for nontraumatic emergency abdominal surgeries respectively. In Tikur Anbessa hospital, acute appendicitis 122(52%), Intestinal obstruction 62 (26%) and PPUD 21 (9%) were the three commonest cause of acute abdomen. [23, 34]

In our study appendicitis and PPUD the leading and third cause of emergency laparotomy respectively, which is similar to the study done in Tikur Anbessa. Viscous perforation is the second commonest diagnosis in our study, while intestinal obstruction was the second commonest diagnosis in Tikur Anbessa Hospital. This difference can be ascribed to the inclusion of trauma as cause of emergency laparotomy and intestinal obstruction was studied separately in our study. [23, 34]

Abdominal trauma (all types) is the third commonest indication 60(18.75%) of emergency laparotomy. The leading causes of abdominal trauma in our study 40(12.5%) were penetrating

[Stab Abdominal Trauma 22(6.9%), Bullet Abdominal trauma 18 (5.6%)] and Blunt Abdominal trauma 20(6.3%). This is comparable with the study done in South Africa the result of which showed: penetrating (85.6%) [Stab wounds (56.8%) and gunshot (28.8%)], and blunt injuries (14.4%). [30].

One hundred and fifteen (35.9%) of operated patients had one or more immediate postoperative complications. This is higher than the study from Gonder (26.6%) and Tikur Anbessa (28%) of operated patients had early (in-hospital) postoperative complications. The three commonest immediate postoperative complications other than death were wound infection 42(13.1%), sepsis 25(7.8%) and pneumonia 21(6.67%). This is similar with the study done in Tikur Anbessa. The complication rate is also in the range of sub-Saharan countries' complication of laparotomy (14-33%). The presence of complication in post-operative was associated with increased mortality ($p=0.00$) and early discharge associated with post op complications ($p=0.000$). [22, 23, 34]

Age of patients (>61 years, $p=0.024$), presence of comorbid illness ($p=0.002$), systolic BP <90 mmhg ($p=.000$), Duration of operation more than 181minutes ($p=0.001$), admission to ICU ($p=0.002$), patients operated after 2 days of admission ($p=0.023$) and those who are discharged early ($p=0.000$) are significantly associated with complication of post emergency laparotomy respectively. After adjusting for confounding variables, vital sign at presentation (systolic <90 mmhg) (odds ratio [AOR] = 0.158, $P = 0.002$), admission to ICU ([AOR] = 0.075, $P=0.03$) and early discharge from Hospital before one week ([AOR] =11.8, $P=0.000$) were independent predictors of post-operative complications in an emergency laparotomy. Except early discharge; other two variables are protective to post-operative complication this is due to patients with (shock, admission to ICU) died early before they develop post-operative complications. Patients who were discharged earlier than one week had more than eleven times chance of developing post-operative complication compared to late discharge.

In this one year study the mortality of patients treated with emergency laparotomy was 10.94% which higher than the study done in Gonder (9.3%), and lower than that of study done in Tikur Anbessa (14%) despite trauma included in our study. But it is in the range mortality rate of sub-Saharan countries' laparotomy which is 10-30%. The mortality rate of research done by the

American College of Surgeons in emergency laparotomy was 14% and thirty-day inpatient mortality of emergency laparotomy was 11% in UK. [10, 21, 22, 23, 34]

The fact that majority of our patients consisted of appendicitis with relatively low mortality rate of 2.9% has definitely underestimated the mortality rate. The mortality rate of 22.8% for perforated viscous and Perforated PUD, Gangrenous sigmoid volvulus, Mesenteric vascular occlusion accounts mortality rate of 11.4% of each. In this study the age of patient >61($p=0.027$), presence of comorbid illness ($p=0.003$), vital sign at presentation (systolic <90mmhg and PR >120, ($p=0.00$ and $p=0.037$ respectively), duration of operation >181 minutes ($p=0.02$) and Admission to ICU ($p=0.041$) are strongly associated with the mortality rate.

After adjusting for confounding variables, age more than 61 years (odds ratio [AOR] =20.280, $P = 0.037$, patient with comorbid illness (AOR =10.473, $p=.016$), vital sign at presentation (systolic <90mmhg) (odds ratio [AOR] =26.73, $P = 0.001$) and having complication post operatively (OR = 29.76, $P = 0.00$), were independent predictors of 30-day mortality in an emergency laparotomy.

It is no coincidence that as people age, their mortality increases, presumably due to the development of medical co-morbidities and their inability to recover as well from insults such as emergency surgery. Deranged vital sign at presentation (systolic blood pressure <90mmhg and pulse rate >120) shows that there is significant physiologic change result in increased mortality rate.

5.2 Conclusions and Recommendation

Peritonitis 145(45.3%), small bowel obstruction 66(20.6%) and large bowel obstruction 44(13.8%) were the commonest three indications for an emergency laparotomy. One hundred and fifteen (35.9%) of operated patients had early within 30 days of postoperative complications. About 11(10.5%) of complication diagnosed at follow up within 30 days of operation. The most common complication was wound infection 42(13.1%), followed by Sepsis 25(7.8%) and pneumonia 21(6.67%). Early discharge from Hospital result in higher post-operative complication in emergency laparotomy.

Emergency laparotomy carries a high rate of mortality, 10.9 % overall, increasing to 28 % in those aged 61 years or older. The commonest intraoperative diagnosis cause for death was viscous perforation 8(22.8%) and followed by perforated Peptic ulcer diseases, gangrenous sigmoid volvulus and mesenteric vascular occlusion each accounts 4(11.4%). Majority of patients 15(42.9%) who died were presented to hospital after 72 hours onset of symptoms and about 20 (57.14%) patients died within the first 72 hours of post operation. Emergency laparotomy carries a high rate of mortality, especially in those over the age of 60 years, and deranged vital sign (shock) at presentation.

Patients with emergency laparotomy should not be discharged early so as to prevent complication. Patients who are older more than 61 years, presented with shock and who has comorbid illness are at higher risk to die post operatively, so more needs to be done to improve outcomes, particularly in this group. This could involve early recognition of patients requiring emergency surgery, adequate preoperative resuscitation and proper post-operative care would help to reduce the observed high mortality. Patients who develop post op complication had high risk of mortality, so early diagnosis and treatment of complication should be done to reduce post-operative mortality.

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Annex

ANNEX I: Information sheet

Annex II: Data collection Questionnaire

St. Paul Hospital Millennium Medical college Department of surgery

Post graduate studies

Questionnaire format

I. Socio-demographic data

1. Age of patient_____
2. Sex A. Male B. Female
3. Religion A. Orthodox B. Muslim C. Protestant
 D. Catholic E. Others
4. Residence A. Urban B. Rural
5. Educational status
 A. Not read and write C. Secondary
 B. Primary D. College
 E. University
6. Occupation
 A. Civil servant C. Student
 B. House Wife D. Farmer
7. Is there any co morbid illness?
 Yes_____ No _____
- 7.1 If yes
specify_____

II. Clinical Data

8. Diagnosis and unit of admission
 A. Unit to which patient is admitted A) General surgery B) urology C) Pediatric surgery
9. Duration of illness_____

10. Vital sign at presentation

- A. Heart rate > 120/min
- B. Systolic BP < 90 mmHg
- C. Within Normal Range

11. Investigation result

- A. CBC WBC_____ Hemoglobin _____
- B. RFT Creatinine_____ BUN_____
- C. LFT AST_____ ALT_____Albumin_____Bilirubin_____

12. Indication for the laparotomy

- A. Peritonitis
- B. Large Bowel obstruction
- C. Small bowel obstruction
- D. Blunt Abdominal trauma
- E. Penetrating Abdominal trauma
- F. Strangulated (Incarcerated) hernia
- G. Others(specify)_____

13. Intraoperative Diagnosis

- A. Perforated Appendicitis
- B. Perforated PUD
- C. Ileal perforation
- D. Typhoid perforation
- E. Colon perforation
- F. Viable Sigmoid volvulus
- G. Gangrenous sigmoid volvulus
- H. Tumor
- I. Post op adhesion
- J. Intussusception
- K. Small bowel volvulus
- L. Primary peritonitis
- M. Mesenteric vascular occlusion
- N. Acute Hemorrhagic pancreatitis
- O. Ileosigmoid knotting
- P. Anastomotic leak
- Q. Abdominal abscess
- R. Tuberculosis peritonitis
- S. Cohn's disease
- T. Gall bladder empyema + Gangrenous Cholecystitis
- U. Meckel's diverticulitis
- V. Mesenteric lymphadenitis
- W. Peritoneal carcinomatosis
- X. Others (specify)_____

14. Types of surgery done

- | | |
|---|---|
| a. Appendectomy and lavage | j. Repair of intestinal perforation |
| b. Peptic ulcer (suture or repair of perforation) | k. Resection of other intra-abdominal tumor |
| c. Resection and primary anastomosis | l. Adhesiolysis |
| d. Milking | m. Homeostasis |
| e. Colectomy Right Subtotal | n. Splenectomy |
| f. Hartmann's procedure | o. Stoma formation |
| g. Colorectal resection | p. Stoma revision |
| h. Drainage of abscess/collection | q. Abdominal closure |
| i. Intestinal bypass | r. Others (specify)_____ |

15. Duration surgery_____

16. Admitted to

- A. General surgical ward
- B. ICU

17. Duration of pre op stay _____

18. Duration of post op stay _____

19. Was there any post-operative complication? Yes. _____No. _____

20. Types of complication

- | | |
|----------------------------|----------------------------|
| a) Sepsis | k) PTE |
| b) Wound infection | l) DVT |
| c) Pneumonia | m) AKI |
| d) Anastomotic leak | n) Electrolyte disturbance |
| e) Intra-abdominal abscess | (specify)_____ |
| f) Hypo-proteinaemia | o) Other (specify)_____ |
| g) ARDS | |
| h) Fecal fistula | |
| i) Wound dehiscence | |
| j) Paralytic Ileus | |

21. Outcome of management(status at discharge)

- a. Died
- b. Improved

22. What was the immediate cause of death?

23. If improved at discharge ,was he/she visited referral clinic within 30days after operation

- a. No
- b. Yes
- c. If yes, how many times _____
- i. Was there any complication(specify)_____