PREVALENCE, PATTERNS AND OUTCOME OF NECROTIZING FASCIITIS CASES SEEN AT JUSH FROM 2011 - 2015 GC.

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A retrospective analysis of prevalence, patterns and outcome of necrotizing fasciitis cases seen at JUSH from 2011 - 2015 GC.

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ABSTRACT

Introduction

Necrotizing bacterial infections are extremely serious, fulminant infections of the soft tissues by virulent bacteria. The annual incidence of NF is estimated at 500–1,000 cases annually, and its prevalence globally has been reported to be 0.40 cases per 100,000 populations. It is seen to have a predilection for men, with a male-to-female ratio of 3:1. The disease affects all age groups.Clinical risk factors for necrotizing soft-tissue infection include diabetes mellitus, malnutrition, obesity, chronic alcoholism, peripheral vascular disease , steroid use, cirrhosis, and autoimmune deficiency syndrome .The mortality associated with NSTI has been in the range of 16% to 45%. Necrotizing fasciitis is uncommon in Ethiopia but the prevalence and risk factor patterns of the disease in Ethiopia setup have not been well studied.

Methods

A retrospective cross-sectional review of medical records of patients who developed necrotizing fasciitis during the period between January 1, 2011 – December 31, 2015 in Jimma University specialized hospital. Patient demographics, presentation, microbiology, treatment, and outcome were recorded.

Data analyzed by description of major variables, and comparison of relationships among variables using computer (SPSS software program). Chi-square and p-value used to determine association between variables and p-value<0.05 considered significant.

Results

Overall, 78 patients were diagnosed with necrotizing fasciitis and mortality rate is 19.23 % (n=15). The prevalence of necrotizing fasciitis in this study is 0.52/100000 population. The mean age of patients was 36.33years (range: 37 days to 80 years). Male s affected in 70.5 % (n=55) and female affected in 29.5% (n=23). There were no obvious predisposing factors in 75.7 % (n=59) cases. From all the patients 15.4% had (n=12) had significant co morbidities. The most common site affected is lower limb (39.7%, n=31) and the next common is perineum (34.6%, n=27). The most common infection site in male was perineum account all this site infection. The median duration of hospital stay was 25.5 days.

Conclusion

This study showed a low prevalence of necrotizing fasciitis infection with a mortality rate of 19.23%. Diabetes mellitus, RVI and malnutrition were identified as the main co-morbidities.

The findings of our study are somewhat limited in their application to other regions and highlight the need for a national analysis of necrotizing fasciitis in the Ethiopia. It is important to have Prospective studies to examine the fitness and sufficiency of these variables as effective predictors of NF mortality.

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ACRONYMS

ARDS – Acute Respiratory Distress Syndrome

ASA – American Society of Anesthesiologists

BP – Blood Pressure

C/C – Chief Compliant

DM – Diabetes Militias

Edi. - Edition

HIV/AIDS – human immunodeficiency virus/acquired immunodeficiency syndrome

HAP – Hospital Acquired Pneumonia

Hr - hour

ICU - Intensive Care Unit

Intra Op – Intra Operative

JU - Jimma University

JUSH - Jimma University Specialized Hospital

KM – kilometer

LRINEC – Laboratory Risk Indicator for NECrotizing Fasciitis

LUSTCS – lower uterine segment transverse incision

SPSS – Statistical Package for Social Studies

Min – minute

MOF – multiple organ failure

NSTIs - Necrotizing Soft Tissue Infections/ Necrotizing Fasciitis

P-value – probability value

Post Op – Post Operative

Pre Op - Preoperative

Resp. - Respectively

RR – Risk Ratio

RVI – Retroviral Infection

V/S – Vital Sign

Wk/wks – week/weeks

CHAPTER ONE

1.1 Background Information

NSTIs are less common than subcutaneous abscesses and cellulitis but are much more serious conditions whose severity may initially be unrecognized. They typically involve deep subcutaneous tissue, superficial or deep fascia, or muscle, or any combination of the three (1).

Necrotizing bacterial infections are extremely serious, fulminant infections of the soft tissues by virulent bacteria that have the ability, usually by the production of toxins, to cause widespread necrosis (2).

NSTIs are characterized by the absence of clear local boundaries or palpable limits which accounts for both the severity of the infection and the frequent delay in recognizing its surgical nature. Anatomically, these infections are marked by a layer of necrotic tissue that is not walled off by a surrounding inflammatory reaction and thus is not typically manifested as an abscess unless it is the initiating factor. In addition, the overlying skin has a relatively normal appearance in the early stages of infection, & the visible degree of involvement is substantially less than that of the underlying tissues (1).

NSTIs have been described by a variety of different labels, including gas gangrene and necrotizing fasciitis. A substantial number of classifications based on anatomic location, microbiology, and depth of infection, among others, have also been described. The wide range of classifications makes understanding of this entity rather confusing, when the only important factor to be determined is the presence or absence of a necrotic component requiring surgical intervention. If suspected, the approach to diagnosis and management of all patients is the same, thus making detailed classification schemes even less useful. We encourage applying the term NSTI to all infections that fit this category (1).

The most common organisms isolated from patients presenting with necrotizing soft-tissue infections include the gram-positive organisms: group A streptococci, enterococci, coagulase-negative staphylococci, *S. aureus*, *S. epidermidis*, and *Clostridium* species.Gram-negative species frequently associated with necrotizing infections include *Escherichia coli*, *Enterobacter*, *Pseudomonas* species, *Proteus* species, *Serratia* species, and bacteroides. Polymicrobial infections tend to be more common than single organism disease in these cases (4).

Deep soft-tissue infections are classified as either necrotizing fasciitis or necrotizing myositis. Necrotizing fasciitis represents a rapid, extensive infection of the fascia deep to the adipose tissue. Necrotizing myositis primarily involves the muscles but typically spreads to adjacent soft tissues (4).

Two distinct types of necrotizing fasciitis have been recognized, based on their different

aetiological agents and slightly different clinical presentations. Necrotizing fasciitis type I is a polymicrobial infection caused by a mixture of anaerobes (e.g. *Bacteroides*, *Peptostreptococcus*), facultative anaerobic cocci (strepto-cocci), and the *Enterobacteriaceae* (e.g. *Escherichia coli*, *Proteus*, and *Klebsiella*). Necrotizing fasciitis type II is also known as streptococcal gangrene and differs from type I in that it is caused by *Strep. pyogenes*. Although it is seen in settings similar to those of the type I there have been outbreaks of type II in fit, healthy young people with no predisposing illness(2).

Clostridial gas gangrene is infection primarily affecting muscle and most commonly occurs in battlefield injuries and in contaminated civilian wounds such as compound fractures. It occasionally occurs after bowel or biliary-tract surgery and arterial insufficiency in the limbs (2).

Successful management of necrotizing fasciitis includes the following: early diagnosis, surgical debridement, antimicrobial therapy, intensive supportive care and hyperbaric oxygen (possibly) (2).

When an extremity is involved, especially in the presence of peripheral vascular disease, amputation may be necessary. When there is extensive perineal necrosis a diverting colostomy may be required (2).

Broad-spectrum antimicrobial cover will be required in all cases to cover Gram-positives, Gram-negatives, and anaerobes. Current therapeutic guidelines recommend benzylpenicillin, gentamicin, and metronidazole. If *Staph. aureus* is isolated a penicillinase-resistant penicillin (e.g. flucloxacillin or dicloxacillin) or first-generation cephalosporin [e.g. cephalothin, cephalexin, cephazolin (cefazolin)] will be required (2).

Supportive intensive care will be necessary in all cases. This will entail nutritional feeding (preferably via the enteric route), aggressive fluid resuscitation, and, if required, blood transfusion, possibly endotracheal intubation and ventilation. Some patients will need inotropic support (2).

In regard to NF of the extremities, the mortality rate is slightly lower than that recorded for abdominal and perineal infections. Patients with Fournier's gangrene that has not spread to the abdominal wall tend to have a better survival. As a general rule, without treatment, the mortality rate approaches 100%. (11)

1.2 Statement of the Problem

The annual incidence of NF is estimated at 500–1,000 cases annually, and its prevalence globally has been reported to be 0.40 cases per 100,000 populations. It is seen to have a predilection for men, with a male-to-female ratio of 3:1; this ratio is mainly correlated with the increased incidence of Fournier's gangrene in men. The disease affects all age groups, although middle-aged and elderly patients (over 50

years of age) are more likely to be infected (11).

Infection of the lower extremities is the most common site of NF (57, 8%), followed by the abdomen and the perineum. NF of the upper limbs is rare compared to that of the lower limb (11).

Clinical risk factors for necrotizing soft-tissue infection include diabetes mellitus, malnutrition, obesity, chronic alcoholism, peripheral vascular disease, chronic lymphocytic leukaemia, steroid use, renal failure, cirrhosis, and autoimmune deficiency syndrome(4).

Site	Mechanism
Limbs	Bite; laceration; intravenous drug use
Abdomen	Abdominal surgery for contamination of peritoneal cavity; incarcerated hernia
Perianal	Ischiorectal abscess; pilonidal abscess
Gynaecological	Bartholin's abscess; vulval abscess in patients with diabetes mellitus
Male genitalia Fournier's gangrene	Urethral trauma; urinary infection
Cervical region	Peritonsillar abscess; dental abscess
Orbit	Periorbital cellulitis; periorbital trauma
Percutaneous instrumentation	Chest tubes; percutaneous endoscopic gastrostomy tubes

Table 1: Portal of entry/aetiology of necrotising fasciitis type I (2).

Early clinical appearances are those of cellulitis. Blistering may develop and crepitus may suggest a gas-forming organism (2).

In advanced stages of the disease, patients usually have overt signs of systemic compromise and septic physiology. Local findings include tense and tender soft tissues associated with ecchymoses or blistering of the skin, or both. The presence of gas detected either by physical examination (crepitus) or by radiographs has been recognized as a grave finding and can be associated with virtually any bacteria, as opposed to the common perception of its unique association with clostridial infections. Most bacteria, especially facultative gram-negative rods such as *E. coli,* make insoluble gases whenever they are forced to use anaerobic metabolism. Thus, the presence of gas in a soft tissue infection implies anaerobic metabolism. Because human tissue cannot survive in an anaerobic environment, gas associated with infection implies dead tissue and therefore a surgical infection (1).

If left untreated the skin becomes shiny, hot, and exquisitely tender but discrete margins do not develop. The skin forms blisters and bullae that contain clear then haemorrhagic fluid. Soft-tissue gas is an uncommon feature of necrotizing fasciitis but is seen when there is anaerobic infection. Finally, as the subcutaneous necrosis continues, with thrombosis of subcutaneous vessels, the overlying skin develops areas of patchy gangrene that can resemble thermal burns (2).

During this progression of local changes the patient will become septicaemic with all the features of septic shock including tachycardia, hypotension, confusion, and marked leucocytosis. There could be

hypocalcaemia due to fat necrosis and multiorgan failure (2).

The diagnosis is difficult and rests on a high index of suspicion. Investigations like Leukocyte count, Gram's stain, culture, Radiographs of affected areas can be done.

The diagnostic test is a full-thickness biopsy of the affected area or surgical exploration. If necrotizing fasciitis is present, one would see watery pus (dishwater liquid) coming out of the tissues and there would be easy separation of the skin from the fascia due to extensive necrosis of the subcutaneous tissues. Anatomical pathology shows the features outlined above (2).

Adequate surgical debridement is essential to the successful management of necrotizing fasciitis. This will require radical excision of all necrotic tissue, drainage of involved fascial planes, and extensive fasciotomy. Careful re-evaluation of the wound and formal re-exploration in the operating theatre under general anaesthetic is also required, often on two to three further occasions (2).

The mortality associated with NSTI has been in the range of 16% to 45%. Multiple prognostic factors have been identified, including the presence of clostridial infection. (1)

The prognosis will depend on the speed and effectiveness of the surgical treatment. Untreated gas gangrene is always fatal; the fatality rate in treated patients ranges from 25 to 40 per cent (2).

There are no well designed studies and published data regarding the prevalence and pattern necrotizing fasciitis in our country.

CHAPTER TWO

LITERATURE REVIEW

2.1 Literature review

2.1.1 Global epidemiological data

The principles of management, including early diagnosis with prompt and repeated surgical debridement, aggressive resuscitation and physiologic support, broad-spectrum antimicrobial drugs, and nutritional support, have been well described. Despite this well-accepted management approach, the mortality rate remains between 16–34% in most major published series (7).

From January 2003 to December 2009, 472 patients treated for NF were included in the study and retrospectively reviewed the medical records of all patients who were admitted to Chi-Mei Medical Center, Tainan, Taiwan, with a diagnosis of NF. The overall mortality was 12.1% (n _ 57) and the 30-day mortality was 11.0% (n _ 52). Multivariate analysis revealed eight independent predictors of mortality for NF including liver cirrhosis, soft tissue air, *Aeromonas* infection, age older than 60 years, band polymorphonuclear neutrophils -10%, activated partial thromboplastin time - 60 s, bacteremia, and serum creatinine - 2 mg/dL . (6).

A retrospective cohort study was performed at three general hospitals located in northern Thailand. All medical records of patients with surgically confirmed NF treated between January 2009 and December 2012 were reviewed. Clinical predictors for mortality were analyzed using multivariable risk regression analysis. Of a total of 1,504 patients with a diagnosis of NF, 19.3% (n=290) died in hospital and 80.7% (n=1,214) survived. Among the fatalities, 92.8% (n=269) died at admission and 7.2% (n=21) died after discharge from the hospital but within 28 days after surgery. From multivariable analysis, being female (risk ratio [RR] =1.37), having chronic heart disease (RR =1.64), cirrhosis (RR =2.36), skin necrosis (RR =1.22), pulse rate 130/min (RR =2.26), systolic BP 90 mmHg (RR =2.05), and serum creatinine $1.6 mg/dL (RR =3.06) were risk factors for mortality (8).

The medical records of patients with necrotizing fasciitis (n = 26) from 1996 to 2005 were retrospectively analyzed in Heinrich Heine University Duesseldorf, Germany. The localization of necrotizing fasciitis was most commonly the trunk (42.3%). Type I polymicrobial infection was the dominating infection. The involvement of anaerobic bacteria was associated with an increase in the number of surgical revisions. Length of postoperative intensive care unit stay, duration of postoperative ventilation and mortality were significantly increased in the ASA

IV-V group. Computed tomography displayed only a limited significance as diagnostic tool for initial diagnosis (10).

A retrospective review of 299 hospital charts of patients discharged with NF diagnosis codes in eight hospitals in New Zeeland between 2000 and 2006. We documented and compared by ethnicity the prevalence of predisposing and precipitating conditions, bacteria isolated, complications and interventions used. Out of 299 charts, 247 fulfilled the case definition. NF was most common in elderly males. Diabetes was the most frequent co-morbid condition, followed by obesity. Nearly a quarter of patients were taking non-steroidal anti-inflammatory drugs (NSAID. *Streptococcus pyogenes* and *Staphylococcus aureus* were the two commonly isolated bacteria. Shock, renal failure, coagulation abnormality and multi-organ dysfunction were common complications. More than 90% of patients underwent surgical debridement, 56% were admitted to an intensive care unit (ICU) and slightly less than half of all patients had blood product transfusion. One in six NF cases had amputations and 23.5% died (14).

A retrospective analysis of all patients referred to the Regional Plastic Surgery Service in Belfast between 2007 and 2012 was performed in Northern Ireland. Forty-six patients were identified with clinical, intraoperative and histopathological confirmation of necrotising fasciitis. Mean patient age was 59.4 years (range 32-88) with a 25:21 male to female ratio. 13 patients died from the disease. Smoking, obesity, diabetes and immunocompromise were the most prevalent co-morbidities identified. 37 patients had no identifiable mechanism of infection initiation in the history. Painful cellulitis (44/46), skin necrosis (26/46), skin blistering (8/46) and subcutaneous emphysema (3/46) were the most common presenting features. The median LRINEC score at presentation was 7 (range 2-12). The lower extremity was the most commonly affected anatomical site (16/46). Group A Streptococcus was the most frequently isolated causative bacterium from debrided tissue cultures (16/46). The prevalence of necrotising fasciitis in the population studied is increasing, particularly in relation to patient cases caused by Group A Streptococcal infection. Increasing bacterial virulence and levels of patient immunocompromise may explain this increasing trend (15).

A retrospective cohort study of patients with a diagnosis of necrotizing soft tissue infection during a 5-year period (1996-2001) were studied in Seattle, Washington. One hundred sixty-six patients were identified and included in the study. The overall mortality rate was 16.9%, and limb loss occurred in 26% of patients with extremity involvement. Independent

predictors of mortality included white blood cell count greater than 30 000 x 10(3)/microL, creatinine level greater than 2 mg/dL (176.8 micromol/L), and heart disease at hospital admission. Independent predictors of limb loss included heart disease and shock (systolic blood pressure <90 mm Hg) at hospital admission. Clostridial infection was an independent predictor for both limb loss (odds ratio, 3.9) and mortality (odds ratio, 4.1) and was highly associated with intravenous drug use and a high rate of leukocytosis on hospital admission. The latter was found to be a good variable in estimating the probability of death. Clostridial infection is consistently associated with poor outcome. This together with the independent predictors mentioned earlier should aid in identifying patients on hospital admission who may benefit from more aggressive and novel therapeutic approaches (16).

The medical records of necrotizing fasciitis patients treated in surgical intensive care unit (SICU) of our hospital from Jan 1995 to Feb 2005 were reviewed retrospectively in India. Ninety-four patients with necrotizing fasciitis were treated in the surgical intensive care unit during the review period. Necrotizing fasciitis accounted for 1.15% of total admissions to our SICU. The mean age of our patients was 48.6 years, 75.5% of the cases were male. Diabetes mellitus was the most common comorbid disease (56.4%), 24.5% patients had hypertension, 14.9% patients had coronary artery disease, 9.6% had renal disease and 6.4% cases were obese. History of operation (11.7%) was most common predisposing factor in our patients. All patients had leucocytosis at admission to the hospital. Mean duration of symptoms was 3.4 days. Mean number of surgical debridement was 2.1, mean sequential organ failure assessment (SOFA) score at admission to SICU was 8.6, 56.38% cases were type 1 necrotizing fasciitis and 43.61% had type 2 infection. Streptococci were most common bacteria isolated (52.1%), commonest regions of the body affected by necrotizing fasciitis were the leg and the foot. Mean intubated days and intensive care unit (ICU) stay was 4.8 and 7.6 days respectively. Mean fluid, blood, fresh frozen plasma and platelets concentrate received in first 24 hours were 4.8 liters, 2.0 units, 3.9 units and 1.6 units respectively. Most commonly used antibiotics were tazocin and clindamycin. Common complication was ventricular tachycardia (6.4). 46.8% patients had multi organ dysfunction, 15 of them died giving mortality of 16% in this study (17).

2.1.2 Epidemiological data from Africa

Ten patients with necrotizing fasciitis were managed in the division of plastic and reconstructive surgery at the University of Ilorin Teaching Hospital, Nigeria**.** The hospital

records of these patients were reviewed and form the basis of this report. The duration of symptoms ranged between one day and three weeks. Most patients presented with associated high grade fever and rigor. Four of the patients had pre-morbid state which could have predisposed them to the infection. They were managed with intravenous fluids, antibiotics and analgesics, most patients had extensive debridement with subsequent wound dressing before skin grafting. The study concluded that early diagnosis, aggressive surgical intervention combined with supportive therapy is crucial to the successful treatment of the disease. If we must reduce the high mortality rate of the condition in our sub-region, early referral is important. Five patients survived while the remaining five died with a crude mortality of 50%. Three of the patients died within 12hours after surgical debridement. The fourth patient died while awaiting surgical procedure, while the fifth patient died on the way to the operating theatre for emergency wound debridement (9).

2.2 Significance of the Study

Necrotizing fasciitis has high mortality rate for this reason early diagnosis and management is very important. It is also important to be familiarized with the most common cause of necrotizing fasciitis and risk factors associated.

Most prevalence and risk factor studies are from western developed countries, while there is a relative scarcity of data from developing countries, particularly from Ethiopia.

To our knowledge, there are no well designed studies and published data regarding the prevalence and pattern necrotizing fasciitis in our setup. The current study aims to assess the disease burden and prevalence and pattern of this disease. Furthermore it will serve as an entry point for future related researchers and programs aiming at its prevention

CHAPTER THREE

OBJECTIVES

3.1 General Objective

To determine prevalence, patterns and outcome of necrotizing fasciitis among patients diagnosed at JUSH.

3.2 Specific Objectives

To determine the demographic pattern of necrotizing fasciitis

To evaluate outcome of necrotizing fasciitis

To evaluate the most common type of necrotizing fasciitis

To determine the risk factor

To determine the most common site involved

To see the complications related with necrotizing fasciitis

To determine the most common presenting compliant

CHAPTER FOUR

METHODS AND MATERIALS

4.1 Study Area and Study Period

The study conducted from January 1, 2011 – December 31, 2015 in Jimma University Specialized Hospital, which is a tertiary hospital resides in Jimma Town, located 352 km South West of Addis Ababa, Ethiopia. The hospital provides health service for more than 15,000, 000 people. Because the cards of the patient in the last five year were available in the card room we use this study period.

The Surgical Department of JUSH is accountable for emergency or elective management of inpatients admitted with surgical cases. There are three inpatient wards; the first two being for elective and emergency surgical admissions while the remaining one is for orthopedic admissions. All surgeries are done in the two major operation rooms except for orthopedic cases which have a special operation room for orthopedic cases. The Anesthesiology department has an ICU unit with six bed and two mechanical ventilators.

4.2 Study Design

Retrospective cross-sectional study based on abstraction of patients' records was used.

4.3 Population

4.3.1 Source Population

The source populations was all patients who were operated or diagnosed in JUSH

4.3.2 Study Population

The study populations were those necrotizing fasciitis patients who were seen in JUSH.

Inclusion criteria:

a. all age group, both sexes and all body parts affected

Exclusion criteria:

a. if the card was lost
b. if the chart was incomplete

4.4 Sample Size and Sampling Technique

4.4.1 Sample size

The sample size was calculated using the formula

$$n= (Z\alpha/2)^2 P (1-P)/d^2$$

Where, n=is the sample size

$Z\alpha/2$=standard normal variance at 95% confidence level (1.96)

P=prevalence of necrotizing fasciitis in this set up is unknown (P=0.5)

d=precision (marginal error) =0.05

Sample size will be n= $(1.96)^2(0.5)\ (0.5)/\ (0.05)^2$

Thus minimum sample size will be 384 patients

Since source population is (98) < 10,000, then the required sample size is calculated with population correction formula

$n_f = n / (1+n/N)$

Where N is the total number of patients in the study time that of 5 years (N=98)

Sample size will be n_f=384 / (1+384/98)

Thus minimum sample size is 78 patients

4.4.2 Sampling technique

A convenient sampling technique was used for all patients fulfilling the inclusion criteria's in the study period used.

4.5 Data Collection/ Measurement

4.5.1 Data Collection

Study units identified from the list on operation notebook and Patient's cards collected from record keeping unit based on card numbers. It was able to collect 78 cards which have full documentation.

4.5.2 Instruments

Structured data abstraction format was prepared based on the sequence of specific objectives of the study and identified variables. The prepared questionnaire filled according to the information available on operation note-book and patients' cards.

4.5.3 Variables

I. Independent Variable

Socio-demographic information (Age, Sex, Address, Marital status, Occupation)

II. Dependent Variables

Co morbidities (diabetes, HIV/AIDS, immunosupression)

Pre-operative investigations' finding

Pre-operative procedures done

Intra-operative finding

Site of infection (Upper extremity, Lower extremity, Head and neck, Trunk, perineum)

Level of training of the surgeon

Operative procedure

Duration of operation

Duration of hospital stay

Post-operative complications

Number of reoperations

Mortality rate

4.5.4 Data collection technique

Available cards thoroughly reviewed and questionnaires filled based on the available information.

4.6 Data Processing and Analysis

The collected data cleared, stored and checked for completeness. Data analyzed by description of major variables, and comparison of relationships among variables using computer (SPSS software program). Results putted with graphs, tables and narratives based on the nature of data. Chi-square and p-value used to determine association between variables and p-value<0.05 considered significant. Since one of the cells in each cross tabulation has expected value less than 5 we were not able to use chi square test to determine the significance of association between mortality rate and age, sex, preop septic shock, preop anemia and medical illness.

The intraoperative recording for duration of operation, amount of blood loss and intraoperative vital sign were poorly recorded and were not analyzed in this study.

4.7 Ethical Considerations

Formal letter were delivered from ethical committee to major Operation Room and record keeping unit of JUSH. Privacy of patients were highly recognized by not exposing their identifications. Results of the study will be disseminated to concerned bodies only.

4.8 Data Quality Assurance

Cautious matching of information on operation notebook to patients' card was done. The collected data was checked for accuracy and completeness on daily basis. Any inconsistent data was rechecked before data analysis.

CHAPTER FIVE

RESULT

Patient demographics

The prevalence of necrotizing fasciitis in this study was calculated as Prevalence =total number of case of necrotizing fasciitis/ total number of population in the catchment area. Total number of cases of necrotizing fasciitis is 78 and total number of population in catchment area is 15,000,000. Prevalence =78/15,000,000 which was 0.52/100000 population.

During the study period from 78 necrotizing fasciitis patients 55 (70.5%) were males and 23(29.5%) were females. Their age range from 37 days to 80 years with mean age 36.33 years. Most group fall in the age group between 15 and 60 years accounting 71.8 % (n=56) of the patients and those between 15 and 44 make up to 51.3%(n=40) of the patients. Most of the males with necrotizing fasciitis lie in age group between 15 and 44 years accounting for 38.4%(n=30) and females have two highest frequency points in age group between 15 - 29 (10.3%, n=8) and 45 - 59 (7.7%, n=6) age groups.(see tables 2, 3 & 4)

Table 2: frequency and percentage of male and female for necrotizing fasciitis during 2011 – 2015 GC at JUSH

		Frequency	Percent
Sex	Male	55	70.5
	Female	23	29.5
	Total	78	100.0

Table 3: frequency & percentage of age for necrotizing fasciitis during 2011 – 2015GC at JUSH

		Frequency	Percent
Age	0-14	9	11.5
	15-29	22	28.2
	30-44	18	23.1
	45-59	16	20.5
	>60	13	16.7
	Total	78	100.0

Table 4: age * sex Cross tabulation for necrotizing fasciitis patients during 2011 - 2015 at JUS

		Sex		Total
		Male	Female	
Age	0-14	4(5.1%)	5(6.4%)	9(11.5%)
	15-29	14(17.9%)	8(10.3%)	22(28.2%)
	30-44	16(20.5%)	2(2.6%)	18(23.1%)
	45-59	10(12.8%)	6(7.7%)	16(20.5%)
	>60	11(14.1)	2(2.6%)	13(16.7%)
Total		55(70.5%)	23(29.5%)	78(100%)

Of the 78 patients 70.5 %(n=55) of people come from rural area and 29.5 %(n=23) come from urban area. Most the people in the age group between 15 -59 come from rural area accounting for 64.1% (n=56) of the people and those age group between 15- 44 come from urban area accounting for 15.4% (n=12) of the people. From 70.5% (n=55) males 52.7 % (n=41) came from rural area and 17.9% (n=14) came from urban and from 29.5% (n=23) females17.9% (n=14) came from rural area and 11.5% (n=9) came from urban. From 93.6% (n=73) necrotizing fasciitis cases 66.7 % (n=52) came from rural area and 26.9% (n= 21) came from urban and from 6.4% (n=5) Myonecrosis 3.8 % (n=3) came from rural area and 2.6% (n= 2) came from urban. (See table 5, 6, 7 & 8)

Table 5: frequency & percentage by area for necrotizing fasciitis during 2011–2015 GC at JUSH

		Frequency	Percent
Area	Urban	23	29.5
	Rural	55	70.5
	Total	78	100.0

Table 6: address * age Cross tabulation for necrotizing fasciitis during 2011 – 2015 GC at JUSH

		Age					Total
		0-14	15-29	30-44	45-59	>60	
address	Urban	2(2.6%)	6(7.7%)	6(7.7%)	4(5.1%)	5(6.4%)	23(29.5%)
	Rural	7((%)	16(20.5%)	12(21.8%)	12(21.8%)	8(10.3%)	55(70.5%)
Total		9(11.5%)	22(28.2%)	18(23.1%)	16(20.5%)	13(16.7%)	78(100%)

Table 7: address * sex Cross tabulation for necrotizing fasciitis patients during 2011 - 2015 GC at JUSH

		Sex		Total
		Male	Female	
address	Urban	14(17.9%)	9(11.5%)	23(29.5%)
	Rural	41(52.7%)	14(17.9%)	55(70.5%)
Total		55(70.5%)	23(29.5%)	78(100%)

Table 8: address * type of necrotizing fasciitis Cross tabulation for necrotizing fasciitis during 2011 – 2015 GC at JUSH

		Type of necrotizing fasciitis		Total
		Necrotizing fasciitis	Myonecrosis	
address	Urban	21(26.9%)	2(2.6%)	23(29.5%)
	Rural	52(66.7%)	3(3.8%)	55(70.5%)
Total		73(93.6%)	5(6.4%)	78(100%)

Predisposing factors

There were no obvious predisposing factors in 75.6 % (n=59) of the cases. Most common predisposing factor in our patients is perianal fistula or abscess, surgery, and trauma. Six patients (7.7%) have perianal abscess or fistula, 5 (6.4%) patients have previous surgery, 3(3.8 %) patients had history of trauma, and 1(1.3%) patient each had snake bite, gangrenous hernia, infected hydrocele, urethral stricture and injection as risk factor. Four patients developed the infection while in hospital after surgery, these include two patient following LUSTCS, one patient following surgery for appendectomy for complicated appendicitis, and another one following right hemicolectomy. One patient present to OPD after traditional circumcision. (See table 9).

Table 9: frequency and percentage of predisposing factors for necrotizing fasciitis during 2011 - 2015 GC at JUSH

	Frequency	Percent
Not identified	47	60.3
Trauma	3	3.8
Surgery	5	6.4
Perianal fistula or abscess	6	7.7
Snake bite	1	1.3
Gangrenous hernia	1	1.3
Infected hydrocele	1	1.3
Injection	1	1.3
Urethral stricture	1	1.3
Medical illness	12	15.4
Total	78	100.0

Of the 78 patients, 15.4% (n=12) had significant co-morbidities. These included 6.4% (n=5) had diabetes mellitus, 3.8% (n=3) had RVI, 2.6% (n=2) had malnutrition, 1.3% (n=1) hypertension, 1.3% (n=1) had thrombocytopenia patients and 1.3% (n=1) had lymphoedema. The duration of stay for those patients with medical illness had two high frequencies for < 1wk and >8wks for 3.8% (n=3) of the people. Of patients with no medical illness 38.4% (n=30) had stayed for three and four weeks. (See table 10.11 & 12).

Table 10: frequency & percentage of co morbidities for necrotizing fasciitis during 2011 - 2015 GC at JUSH

	Frequency	Percent
yes	12	15.4
no	66	84.6
Total	78	100.0

Table 11: The three most common co-morbidities present in necrotizing fasciitis patients during 2011 - 2015 GC at JUSH

	Frequency	Percent
no medical illness	66	84.6
diabetes mellitus	5	6.4
malnutrition	2	2.6
RVI	3	3.8
other	2	2.6
Total	78	100.0

Table 12: total duration of hospital stay * medical illness Crosstabulation for necrotizing fasciitis during 2011 - 2015 GC at JUSH

		medical illness		Total
		yes	no	
total duration of hospital saty	=<1 week	3(3.8%)	8(10.3%)	11(14.1%)
	2weeks	0	2(2.6%)	2(2.6%)
	3 weeks	2(2.6%)	16(20.5%)	18(23.1%)
	4 weeks	1(1.3%)	14(17.9%)	15(19.2%)
	5 weeks	1(1.3%)	6(7.7%)	7(9%)
	6 weeks	2(2.6%)	6(7.7%)	8(10.3%)
	7 weeks	0	1(1.3%)	1(1.3%)
	8 weeks	0	4(5.1%)	4(5.1%)
	> 8weeks	3(3.8%)	9(11.5%)	12(21.8%)
Total		12(21.8%)	66(84.6%)	78(100%)

Clinical presentation

On presentation, 91 % (n=71%) patients had swelling as chief compliant and of this patients 5.1% (n=4) and 3.8% (n=3) additional chief compliant like pain and ulceration respectively. In total considering only one chief compliant 74.4% (n=58) patients present with swelling, 14.1% (n=11) patients present with pain, 3.8% (n=3) patients present with fever and 7.7% (n=6) patients present with ulceration. (See table 13)

Table 13: frequency and percentage of chief compliant for necrotizing fasciitis during 2011 - 2015 GC at JUSH

	Frequency	Percent
pain	11	14.1
swelling	58	74.4
fever	3	3.8
ulceration	6	7.7
Total	78	100.0

The most common site of infection was the lower limb 39.7% (n=31) and the next common is perineum 34.6% (n=27) and then torso in 19.2% (n=15). Of 70.5% (n=55) male patients, the most common infection site is the perineum accounting for 34.6 % (n=27) and next common infection site was lower extremity accounting for 24.4% (n=19) cases and then torso which is 7.7 % (n=6). Of the 29.5% (n=23) females affected the most common site is lower extremity accounting for 15.3 % (n=12) and next common is torso 11.5% (n=9) and then upper extremity 2.6% (n=2). All the perineum infections were in male which was foreigner gangrene. Most of the perineum infection 25.6% (n=20) stayed for 3 and 4 weeks in the hospital and the lower extremity had two high frequencies for <1 week for 9% (n=7) of patients and for >8 weeks for 10.3% (n=8) of patients. (See table 14, 15 & 16).

Table 14: frequency & percentage site of infection for necrotizing fasciitis during 2011-2015 GC at JUSH

		Frequency	Percent
Site of infection	perineum	27	34.6
	upper extremity	4	5.1
	lower extremity	31	39.7
	torso	15	19.2
	other	1	1.3
	Total	78	100.0

Table15: anatomic site involved * sex Crosstabulation for necrotizing fasciitis during 2011 - 2015 GC at JUSH

		sex		Total
		male	female	
anatomic site involved	perineum	27(34.6%)	0	27(34.6%)
	upper extremity	2(2.6%)	2(2.6%)	4(5.1%)
	lower extremity	19(24.4%)	12(15.3%)	31(39.7%)
	torso	6(7.7%)	9(11.5%)	15(19.2%)
	other	1(1.3%)	0	1(1.3%)
Total		55(70.5%)	23(29.5%)	78(100%)

Table 16: anatomic site involved * total duration of hospital stay Crosstabulation for necrotizing fasciitis during 2011 - 2015 GC at JUSH

		total duration of hospital stay									Total
		=<1 week	2weeks	3 weeks	4 weeks	5 weeks	6 weeks	7 weeks	8 weeks	> 8weeks	
anatomic site involved	perineum	2(2.6%)	1(1.3%)	9(11.5%)	11(14.1%)	2(2.6%)	0	1(1.3%)	0	1(1.3%)	27(34.6%)
	upper extremity	0	0	2(2.6%)	0	0	1(1.3%)	0	1(1.3%)	0	4(5.1%)
	lower extremity	7(9%)	1(1.3%)	4(5.1%)	3(3.8%)	2(2.6%)	5(6.4%)	0	1(1.3%)	8(10.3%)	31(39.7)
	torso	1(1.3%)	0	3(3.8%)	1(1.3%)	3(3.8%)	2(2.6%)	0	2(2.6%)	3(3.8%)	15(19.2%)
	other	1(1.3%)	0	0	0	0	0	0	0	0	1(1.3%)
Total		11(14.1%)	2(2.6%)	18(23.1%)	15(19.2%)	7(9%)	8(10.3%)	1(1.3%)	4(5.1%)	12(21.8%)	78(100%)

Investigations

Of the 78 patients 25.6 % (n=20) of the patients had preop anemia at initial presentation. Most had mild and moderate anemia (11.5%, n=9 and 10.3%, n=8 resp.) but only 3.8 % (n=3) had severe anemia. (See table 17 & 18)

Table 17: frequency and percentage of preop Anemia for necrotizing fasciitis during 2011 - 2015 GC at JUSH

Preop anemia	Frequency	Percent
yes	20	25.6
no	58	74.4
Total	78	100.0

Table 18: frequency and percentage of severity of preop anemia for necrotizing fasciitis during 2011 - 2015 GC at JUSH

Preop anemia	Frequency	Percent
no anemia	58	74.4
mild	9	11.5
moderate	8	10.3
severe	3	3.8
Total	78	100.0

Of the 78 patients with necrotizing infection 93.6% (n=73) present with necrotizing fasciitis and the rest 6.4 % (n=5) present with myonecrosis. (See table 19)

Table 19: frequency and percentage of type of necrotizing fasciitis for necrotizing fasciitis during 2011 - 2015 GC at JUSH

	Frequency	Percent
necrotizing fasciitis	73	93.6
myonecrosis	5	6.4
Total	78	100.0

Treatment

Most patients were treated with broad spectrum antibiotics initially. Almost all patients 94.9% (except 4) were operated by resident. All of the patients underwent debridement. Of these, 14.1 %(n=11) patients required multiple incision and limiting incision and 3.8 %(n=3) patient required amputation of the limb during the initial surgery. The median number of debridement required was 2(maximum number was 7). Of all patients with debridement only, which accounting for 82.1 % (n=64), 42.3 % (n=33) had wound approximation and 26.9% (n=21) had skin graft and 12.8% (n=10) had died after debridement. Of

all patients who had amputation 1.3% (n=1) had skin graft and 2.6% (n=2) had wound approximation. Of all patients with multiple incision 6.4% (n=5) had died and 5.1% (n=4) had skin graft and 2.6% (n=2) had wound approximation. Of all patients with debridement only 39.7% (n=31) and of all patients with multiple incision 5.1 % (n=4) had stayed for 3 and 4 weeks. All of the patients who had stayed for less than one week and had initial multiple incision or limiting incision had died. (See table 20, 21, 22, 23 & 24)

Of all patient who had improved 47.4 % (n=37) patients had wound approximation and 33.3% (n=26) had skin graft as a final procedure. Most patients had skin graft after 2nd debridement in 15.3% (n=12) and the next common skin graft time was after initial debridement accounting for 7.7% (n=6). From all wound approximation (47.6%, n=37) patients who had wound approximation after first & second debridement were 39.8% (n=31). (See table 25 & 26)

The median duration of stay in hospital was 25.5 days (range: 1 day to more than 2 months). The average length of hospital stay was 27 days. Of 78 patients 42.1 % (n=33) stayed for 3 and 4 weeks. (See table 27)

Table 20: frequency and percentage of type of initial surgical management for necrotizing fasciitis during 2011 - 2015 GC at JUSH

	Frequency	Percent
multiple incision or limiting incision	11	14.1
Amputation	3	3.8
Debridement	64	82.1
Total	78	100.0

Table 21: frequency and percentage of debridement for necrotizing fasciitis patients during 2011 - 2015 GC at JUSH

	Frequency	Percent
1	31	39.7
2	27	34.6
3	13	16.7
4	2	2.6
5	2	2.6
6	2	2.6
>7	1	1.3
Total	78	100.0

Table 22: total duration of hospital stay * type of operation Crosstabulation for necrotizing fasciitis patients during 2011 - 2015 GC at JUSH

		type of operation			Total
		multiple or limiting incision	amputation	debridement	
total duration of hospital stay	=<1 week	4(5.1%)	0	7(9%)	11(14.1%)
	2weeks	0	0	2(2.6%)	2(2.6%)
	3 weeks	1(1.3%)	0	17(21.8%)	18(23.1%)
	4 weeks	0	1(1.3%)	14(17.9%)	15(19.2%)
	5 weeks	2(2.6%)	0	5(6.4%)	7(9%)
	6 weeks	1(1.3%)	0	7(9%)	8(10.3%)
	7 weeks	0	0	1(1.3%)	1(1.3%)
	8 weeks	1(1.3%)	1(1.3%)	2(2.6%)	4(5.1%)
	> 8weeks	2(2.6%)	1(1.3%)	9(11.5%)	12(15.3%)
Total		11(14.1%)	3(3.8%)	64(82.1%)	78(100%)

Table 23: total duration of hospital stay * frequency of debridement Crosstabulation for necrotizing fasciitis patients during 2011 - 2015 GC at JUSH

		frequency of debridement							Total
		1	2	3	4	5	6	>7	
total duration of hospital stay	=<1 week	8(10.3%)	1(1.3%)	2(2.6%)	0	0	0	0	11(14.1%)
	2weeks	1(1.3%)	0	1(1.3%)	0	0	0	0	2(2.6%)
	3 weeks	11(14.1%)	5(6.4%)	2(2.6%)	0	0	0	0	18(23.1%)
	4 weeks	7(9%)	5(6.4%)	2(2.6%)	1(1.3%)	0	0	0	15(19.2%)
	5 weeks	3(3.8%)	3(3.8%)	1(1.3%)	0	0	0	0	7(9%)
	6 weeks	0	5(6.4%)	1(1.3%)	0	1(1.3%)	1(1.3%)	0	8(10.3%)
	7 weeks	0	0	1(1.3%)	0	0	0	0	1(1.3%)
	8 weeks	0	3(3.8%)	1(1.3%)	0	0	0	0	4(5.1%)
	> 8weeks	1(1.3%)	5(6.4%)	2(2.6%)	1(1.3%)	1(1.3%)	1(1.3%)	1(1.3%)	12(15.3%)
Total		31(39.7%)	27(34.6%)	13(16.7%)	2(2.6%)	2(2.6%)	2(2.6%)	1(1.3%)	78(100%)

Table 24: type of operation * type of wound closure Crosstabulation for necrotizing fasciitis during 2011 - 2015 GC at JUSH

		type of wound closure			Total
		skin graft	wound approx.	other	
type of operation	multiple or limiting incision	4(5.1%)	2(2.6%)	5(6.4%)	11(14.1%)
	amputation	1(1.3%)	2(2.6%)	0	3(3.8%)
	debridement	21(26.9%)	33(42.3%)	10(12.8%)	64(82.1%)
Total		26(33.3%)	37(47.4%)	15(19.2%)	78(100%_

Table 25: frequency and percentage of wound closure for necrotizing fasciitis patients during 2011 - 2015 GC at JUSH

	Frequency	Percent
skin graft	26	33.3
wound approximation	37	47.4
other	15	19.2
Total	78	100.0

Table 26: frequency of debridement * type of wound closure Crosstabulation for necrotizing fasciitis patients during 2011 - 2015 GC at JUSH

		type of wound closure			Total
		skin graft	wound approx	other	
frequency of debridement	1	6(7.7 %)	18(23.1%)	7(9%)	31(39.7%)
	2	12(15.3%)	13(16.7%)	2(2.6%)	27(34.6%)
	3	4(5.1%)	4(5.1%)	5(6.4%)	13(16.7%)
	4	1(1.3%)	1(1.3%)	0	2(2.6%)
	5	1(1.3%)	1(1.3%)	0	2(2.6%)
	6	2(2.6%)	0	0	2(2.6%)
	>7	0	0	1(1.3%)	1(1.3%)
Total		26(33.3%)	37(47.4%)	15(19.2%)	78(100%)

Table 27: frequency and percentage of hospital stay for necrotizing fasciitis patients during 2011 - 2015 GC at JUSH

	Frequency	Percent
=<1 week	11	14.1
2weeks	2	2.6
3 weeks	18	23.1
4 weeks	15	19.2
5 weeks	7	9.0
6 weeks	8	10.3
7 weeks	1	1.3
8 weeks	4	5.1
> 8weeks	12	15.4
Total	78	100.0

Complication

Complication present in 21.8% (n=17) cases of which most common was MOF 7.7% (n=6) and next common was wound infection was 5.1% (n=4). Of 39.7% (n =31) patients with lower limb infection 11.5 % (n=9) had post op complication and of these 5.1% (n=4) had septic shock and 1.3% (n=1) each had wound infection, HAP and MOF. Of 19.2% (n =15) patients with torso infection 5.1 % (n=4) had post op complication and of these 2.6% (n=2) had HAP and 1.3% (n=1) each had respiratory failure and MOF. Of 34.6% (n =27) patients with perineum infection 3.8 % (n=3) had post op complication and of these 2.6% (n=2) had wound infection and 1.3% (n=1) had MOF. (See table 28, 29, 30 & 31)

Table 28: Frequency of complication for necrotizing fasciitis patients during 2011 - 2015 GC at JUSH

	Frequency	Percent
yes	17	21.8
no	61	78.2
Total	78	100.0

Table 29: frequency of type of complication for necrotizing fasciitis patients during 2011 - 2015 GC at JUSH

	Frequency	Percent
no complication	61	78.2
wound infection	4	5.1
septic shock	2	2.6
MOF	6	7.7
HAP	3	3.8
respiratory failure	1	1.3
Post op anemia	1	1.3
Total	78	100.0

Table 30: anatomic site involved * postop complication Crosstabulation for necrotizing fasciitis during 2011 - 2015 GC at JUSH

		postop complication		Total
		yes	no	
anatomic site involved	perineum	3(3.8%)	24(30.8%)	27(34.6%)
	upper extremity	1(1.3%)	3(3.8%)	4(5.1%)
	lower extremity	9(11.5)	22(28.2%)	31(39.7%)
	torso	4(5.1%)	11(14.1%)	15(19.2%)
	other	0	1(1.3%)	1(1.3%)
Total		17(21.8%)	61(78.2%)	78(100%)

Table 31: anatomic site involved * frequency of postop complication Crosstabulation for necrotizing fasciitis during 2011 - 2015 GC at JUSH

		frequency of postop complication							Total
		no complication	wound infection	septic shock	MOF	HAP	respiratory failure	Post op anemia	
anatomic site involved	perinium	24(30.8%)	2(2.6%)	0	1(1.3%)	0	0	0	27(34.6%)
	upper extrimity	3(3.8%)	1(1.3%)	0	0	0	0	0	4(5.1%)
	lower extrimity	22(28.2%)	1(1.3%)	2(2.6%)	4(5.1%)	1(1.3%)	0	1(1.3%)	31(39.7%)
	torso	11(14.1%)	0	0	1(1.3%)	2(2.6%)	1(1.3%)	0	15(19.2%)
	other	1(1.3%)	0	0	0	0	0	0	1(1.3%)
Total		61(78.2%)	4(5.1%)	2(2.6%)	6(7.7%)	3(3.8%)	1(1.3%)	1(1.3%)	78(100%)

Mortality

Fifteen of the 78 patients died (19.23% mortality rate). The median age of those who died was 50 years (range: 8 to 75 years) while the median age of the rest of the cohort was 35 years (range: 37 days to 80 years).

Of 24.4% (n=19) patients with predisposing factor 5.1% (n=4) had died, these include 1.3% (n=1) patient each from perianal abscess, surgery, snake bite, and gangrenous hernia. Of these deaths, 4 patients were with severe co-morbidities. Three patients had diabetes mellitus and one of the patients had malnutrition. All the patients who stayed <1wk with medical illness are died within 1,2 and 6 days, these

include two diabetes mellitus and one malnutrition patient. The most common site of infection with high mortality was the lower extremity with 11.5% (n=9) and the next common was torso with 3.8% (n=3) and then each had 1.3% (n=1) from sites like perineum, upper extremity and neck. (See table 32, 33, 34, & 35)

Of 78 patients 7.7% (n=6) patients have septic shock at presentation with unrecordable BP and from all the patients with septic shock 5.1% (n=4) had died (that is 66.6 % of patient with septic shock had died) (See table 36 & 37).

Of all patients with debridement only 12.8% (n=10) had died after debridement. Of all patients with multiple incision 6.4% (n=5) had died. From all the patients who had initial multiple incision or limiting incision 45.5% (5/11*100%) had died. All of the patients who had stayed for less than one week and had initial multiple incision or limiting incision had died. Most patients died after initial debridement 9% (n=7) and next common is after third debridement accounting g for 6.4 % (n=5). From all alive patients 62.9% (n=49) had improved after first and second debridement. (See table 38 & 39)

Of all patient who discharge after improvement 38.4% (n=30) stayed for 3 and 4 weeks and of all patients who died (n=15) 12.8 %(n=10) died in first week. Of all the people who died 66.7 % of the people stayed only one week. (See table 40)

Table 32: risk factor * condition of discharge Cross tabulation for necrotizing fasciitis patients during 2011 - 2015 GC at JUSH

		Condition of discharge		Total
		Improved	Dead	
Risk factor	Not identified	40(51.3%)	7(9%)	47(60.3%)
	Trauma	3(3.8%)	0	3(3.8%)
	Surgery	4(5.1%)	1(1.3%)	5(6.4%)
	Perianal fistula or abscess	5(6.4%)	1(1.3%)	6(7.7%)
	Snake bite	0	1(1.3%)	1(1.3%)
	Gangrenous hernia	0	1(1.3%)	1(1.3%)
	Infected hydrocele	1(1.3%)	0	1(1.3%)
	Injection	1(1.3%)	0	1(1.3%)
	Urethral stricture	1(1.3%)	0	1(1.3%)
	Medical illness	8(10.3%)	4(5.1%)	12(21.8%)
Total		63(80.8%)	15(19.2%)	78(100%)

Table 33: medical illness * condition of discharge Crosstabulation for necrotizing fasciitis patients during 2011 - 2015 GC at JUSH

		condition of discharge		Total
		improved	dead	
medical illness	yes	8(10.3%)	4	12
	no	55(70.5%)	11	66
Total		63	15	78

Table 34: type of medical illness * condition of discharge Crosstabulation for necrotizing fasciitis patients during 2011 - 2015 GC at JUSH

		condition of discharge		Total
		improved	dead	
type of medical illness	no medical illness	55(70.5%)	11(14.1%)	66(84.6%)
	diabetes mellitus	2(2.6%)	3(3.8%)	5(6.4%)
	malnutrition	1(1.3%)	1(1.3%)	2(2.6%)
	RVI	3(3.8%)	0	3(3.8%)
	other	2(2.6%)	0	2(2.6%)
Total		63(80.8%)	15(19.2%)	78(100%)

Table 35: anatomic site involved * condition of discharge Crosstabulation for necrotizing fasciitis during 2011 - 2015 GC at JUSH

		condition of discharge		Total
		improved	dead	
anatomic site involved	perineum	26(33.3%)	1(1.3%)	27(34.6%)
	upper extremity	3(3.8%)	1(1.3%)	4(5.1%)
	lower extremity	22(28.2%)	9(11.5%)	31(39.7%)
	torso	12(15.3)	3(3.8%)	15(19.2%)
	other	0	1(1.3%)	1(1.3%)
Total		63(80.8)	15(19.2%)	78(100%)

Table 36: vital sign * preop septic shock Cross tabulation for necrotizing fasciitis during 2011 - 2015 GC at JUSH

		preop septic shock		Total
		yes	no	
vital sign	unrecordable	6(7.7%)	0	6(7.7%)
	<90/60	0	2(2.6%)	2(2.6%)
	>90/60	0	70(89.7%)	70(89.7%)
Total		6(7.7%)	72(92.3%)	78(100%)

Table 37: preop septic shock * condition of discharge Crosstabulation for necrotizing fasciitis during 2011 - 2015 GC at JUSH

		condition of discharge		Total
		improved	dead	
preop septic shock	yes	2(2.6%)	4(5.1%)	6(7.7%)
	no	61(78.2%)	11(14.1%)	72(92.3%)
Total		63(80.8%)	15(19.2%)	78(100%)

Table 38: type of operation * condition of discharge Crosstabulation for necrotizing fasciitis patients during 2011 - 2015 GC at JUSH

		condition of discharge		Total
		improved	dead	
type of operation	multiple or limiting incision	6(7.7%)	5(6.4%)	11(14.1%)
	amputation	3(3.8%)	0	3(3.8%)
	debridement	54(69.2%)	10(12.8%)	64(82.1%)
Total		63(80.8%)	15(19.2%)	78(100%)

Table 39: frequency of debridement * condition of discharge Crosstabulation for necrotizing fasciitis patients during 2011 - 2015 GC at JUSH

		condition of discharge		Total
		improved	dead	
frequency of debridement	1	24(30.8%)	7(9%)	31(39.7%)
	2	25(32.1%)	2(2.6%)	27(34.6%)
	3	8(10.3%)	5(6.4%)	13(16.7%)
	4	2(2.6%)	0	2(2.6%)
	5	2(2.6%)	0	2(2.6%)
	6	2(2.6%)	0	2(2.6%)
	>7	0	1(1.3%)	1(1.3%)
Total		63(80.8%)	15(19.2%)	78(100%)

Table 40: total duration of hospital stay * condition of discharge Crosstabulation for necrotizing fasciitis patients during 2011 - 2015 GC at JUSH

		condition of discharge		Total
		improved	dead	
total duration of hospital stay	=<1 week	1(1.3%)	10(12.8%)	11(14.1%)
	2weeks	2(2.6%)	0	2(2.6%)
	3 weeks	15(19.2%)	3(3.8%)	18(23.1%)
	4 weeks	15(19.2%)	0	15(19.2%)
	5 weeks	7(9%)	0	7(9%)
	6 weeks	7(9%)	1(1.3%)	8(10.3%)
	7 weeks	1(1.3%)	0	1(1.3%)
	8 weeks	4(5.1%)	0	4(5.1%)
	> 8weeks	11(14.1%)	1(1.3%)	12(15.3%)
Total		63(80.8%)	15(19.2%)	78(100%)

CHAPTER SIX

DICUSSION

This is the first clinical retrospective study designed to predict death in patients with NTSI. It is derived from a large catchment area of patients around Jimma with total population around 15,000,000. It uses simple variables including all available at the time of admission and intraoperative and post operative findings.

The study of association of different parameters based on the Crosstabulation have showed clinical significance but the statistical significance testes by chi square showed at least one of the cells in each cross tabulation has expected value less than 5 which indicate that we were not able to use chi square test to determine the significance of association between mortality rate and age, sex, preop septic shock, preop anemia, medical illness, duration of hospital say and others.

The intraoperative recording for duration of operation, amount of blood loss and intraoperative vital sign were poorly recorded and were not analyzed in this study and also the radiological investigation parameters are not complete and we couldn't get there result of them and for that reason they are omitted.

During the five-year study period 78 necrotizing fasciitis patients were treated. The mean age of the patients was 36.33 years (range 37 days to 80 years). A study in Northern Ireland from 2007 to 2012 showed Mean patient age of 59.4 years (range 32-88) with a 25:21 male to female ratio

The prevalence globally has been reported to be 0.40 cases per 100,000 populations. It is seen to have a predilection for men, with a male-to-female ratio of 3:1; this ratio is mainly correlated with the increased incidence of Fournier's gangrene in men. In our study the prevalence of necrotizing fasciitis in was 0.52/100000 population. During the study period from 78 necrotizing fasciitis patients 55 (70.5%) were male and 23(29.5%) were female which has male to female ratio of around 2.4:1 which is comparative to global value. All the perineum infections were in male which were foreigner gangrene which correlate with increased male infection. Of the 78 patients 70.5 %(n=55) of people come from rural area and 29.5 %(n=23) come from urban area

The most common infection site was the lower limb 39.7 % in our setup. A study done in Germany from 1996 to 2005 reported the most common site of infection was the trunk (42.3%). Another study between 2007 and 2012 in Northern Ireland showed the lower extremity was the most commonly affected anatomical site (16/46). And also from Jan 1995 to Feb 2005 in India report commonest regions of the body affected by necrotizing fasciitis were the leg and the foot.

Almost all (except 7 cases) patients had swelling as chief compliant in our set up. While a study

in Northern Ireland done from 2007 to 2012 showed Painful cellulitis (44/46), skin necrosis (26/46), as the most common presenting features.

Diabetes mellitus is the most common comorbid condition followed by RVI in our setup. In research done in New Zeeland between 2000 and 2006 Diabetes was the most frequent co-morbid condition, followed by obesity. In research done in India from Jan 1995 to Feb 2005, Diabetes mellitus was the most common comorbid disease (56.4%).

The most common Predisposing factor in our setup are perianal fistula and or abscess (7.7%, n=6), surgery (History of operation) (6.4, n=5) and trauma (3.8, n=3). A study done in India from Jan 1995 to Feb 2005 showed history of operation (11.7%) was most common predisposing factor.

Of the 78 patients 25.6 % (n=20) of the patients had preop anemia at initial presentation. Most had mild and moderate anemia (11.5%, n=9 and 10.3%, n=8 resp.) but only 3.8 % had severe anemia.

Of the 78 patients with necrotizing infection 93.6% (n=73) present with necrotizing fasciitis and the rest 6.4 % (n=5) present with myonecrosis.

Most patients were treated with broad spectrum antibiotics initially. Almost all patients 94.9% (except 4) were operated by resident. All of the patients underwent debridement. Of these, 14.1 %(n=11) patients required multiple incision and limiting incision and 3.8 %(n=3) patient required amputation of the limb during the initial surgery. The median number of debridement required was 2(maximum number was 7). The median duration of stay in hospital was 25.5 days (range: 1 day to more than 2 months). The average length of hospital stay was 27 days

Complication present in 21.8% (n=17) cases of which most common was MOF 7.7 (n=6) and wound infection was 5.1% (n=4). Of 39.7% (n =31) patients with lower limb infection 11.5 % (n=9) had post op complication and of these 5.1% (n=4) had septic shock and 1.3% (n=1) each had wound infection, HAP and MOF. Of 19.2% (n =15) patients with torso infection 5.1 % (n=4) had post op complication and of these 2.6% (n=2) had HAP and 1.3% (n=1) each had respiratory failure and MOF

All patients underwent surgical treatment and the mortality rate was 19.23 % (n=15) in our study. A study in India from January 1995 to February 2005 reported the mortality rate as 16 % and another showed it was 12% in the study done in Taiwan from January 2003 to December 2009.

Of 24.4% (n=19) patients with predisposing factor 5.1% (n=4) had died, these include 1.3% (n=1) patient each from perianal abscess, surgery, snake bite, and gangrenous hernia. Of these deaths, 4 patients were with severe co-morbidities

Of 78 patients 7.7% (n=6) patients have septic shock at presentation with unrecordable BP and

from all the patients with septic shock 5.1% (n=4) had died (that is 66.6 % of patient with septic shock had died)

Of all patients with debridement only 12.8% (n=10) had died after debridement. Of all patients with multiple incision 6.4% (n=5) had died. From all the patients who had initial multiple incision or limiting incision 45.5% (5/11*100%) had died.

CHAPTER 7

CONCLUSION AND RECOMMENDATIONS

This five-year review has shown a low incidence of necrotizing fasciitis infection with a mortality rate of 19.23%. Diabetes mellitus, RVI and malnutrition were identified as the main co-morbidities.

The findings of our study are somewhat limited in their application to other regions and highlight the need for a national analysis of necrotizing fasciitis in the Ethiopia.

It is important to have Prospective studies to examine the fitness and sufficiency of these variables as effective predictors of NF mortality

Emphasis must remain on expert clinical diagnosis and judgment in order not to delay surgical treatment as well as use of the multidisciplinary team.

In the future studies it is important to consider the following variables

Duration of symptoms

Radiographic results to be collected and assessed

Antibiotics commonly used and any resistance

The type common bacteria identified by examining the culture result

LRINEC scoring system

ICU stay and Duration of ventilation

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ANNEX-I

DUMMY TABLES

Table 41: Age by sex distribution of patients who come with diagnosis of necrotizing fasciitis during 2011 - 2015 GC at JUSH

Age of patients	Male	Female
0-14		
15-29		
30-44		
45-59		
>60		
35-39		
Total		

Table 42: frequency of the presenting chief compliant during 2011 - 2015 GC at JUSH

Chief compliant	Frequency	Percentage
Pain		
Fever		
Swelling		
Ulceration		
Total		

Table 43: Prevalence of preoperative septic shock cases among patients who had necrotizing fasciitis during 2011 - 2015 GC at JUSH

Presence of Septic shock	Frequency	Percentage
Yes		
No		

Table 44: Prevalence of preoperative anemia among patients who had necrotizing fasciitis during 2011 - 2015 GC at JUSH

Presence of Anemia	Frequency	Percentage

Yes		
No		

Table 45: Prevalence of medical illness present preoperatively among patients who had necrotizing fasciitis during 2011 - 2015 GC at JUSH

Medical Illness	Frequency	Percentage
Diabetes mellitus		
Malnutrition		
Hypertension		
RVI		
steroid use		
Total		

Table 46: Frequency of patients who received preoperative investigation, and antibiotics among patients who had necrotizing fasciitis during 2011 - 2015 GC at JUSH

Preoperative procedure	Frequency	Percentage
Radiological Investigation		
Hemoglobin		
leukocyte count		
Antibiotics		

Table 47: Level of Training of surgeons who performed operation for necrotizing fasciitis during 2011 - 2015 GC at JUSH

Level of Training	Frequency	Percentage
Consultant Surgeon		
Resident		

Table 48: Frequency of type of necrotizing fasciitis during 2011 - 2015 GC at JUSH

Intra-operative conditions	Frequency	Percentage
Necrotizing fasciitis		
Myonecrosis		

Table 49: The operation time taken for operation of necrotizing fasciitis during 2011 - 2015 GC at JUSH

Operation Time	Frequency	Percentage
< 30 min		
30-60 min		
1 hr-1.5 hr		
1.5 - 2 hrs		
>= 2 hrs		
Total		

Table 50: Frequency of type of operation done for necrotizing fasciitis during 2011 - 2015 GC at JUSH

Type of operation	Frequency	Percentage
Multiple incision		
Amputation		
Debridement		

Table 51: Frequency of intra-operative conditions of the patient for necrotizing fasciitis during 2011 - 2015 GC at JUSH

Intra-operative conditions	Frequency	Percentage
Deranged Vital signs		
Significant blood loss		
Unable to awake from anesthesia		

Table 52: Frequency of anatomic site involved by necrotizing fasciitis during 2011 - 2015 GC at JUSH

Intra-operative conditions	Frequency	Percentage
Upper Extremity		
Lower extremity		
Perineum		
Torso		
Head and neck		

Table 53: Number of postoperative complications seen among patients who underwent operation for necrotizing fasciitis during 2011 - 2015 GC at JUSH

Postoperative complications	Frequency	Percentage
Yes		
No		

Table 54: Frequency of complications seen after operation done for necrotizing fasciitis during 2011 - 2015 GC at JUSH

Complications	Frequency	Percentage
wound Infection		
Hospital acquired pneumonia		
MOF		
Respiratory failure		
Septic shock		

Table 55: Frequency of re-debridement's done for necrotizing fasciitis patients during 2011 - 2015 GC at JUSH

Re-debridement	Frequency	Percentage
1		
2		
3		

Table 56: Frequency of type of wound closure done for necrotizing fasciitis during 2011 - 2015

GC at JUSH

Reconstructive surgery	Frequency	Percentage
Skin graft		
Wound approximation		

Table 57: duration hospital stay for necrotizing fasciitis during 2011 - 2015 GC at JUSH

Duration of stay	Frequency	Percentage
1. <1wk		
2. 2 wks		
3. 3 wks		
4. 4 wks		
5. 5wks		
6. 6wks		

Table 58: The conditions at discharge of patients after operation done for necrotizing fasciitis during 2011 - 2015 GC at JUSH

Condition of discharge	Frequency	Percentage
Improved		
Died		
Total		

ANNEX-II

QUESTIONAIRE

Questionnaire on retrospective analysis of prevalence, pattern and outcome of necrotizing fasciitis for cases seen at JUSH from 2011 - 2015 GC.

Part I: Socio-demographic Information.

1. Age____

2. Sex: M____ F____

3. Address: Rural _____ Urban_____

Part II: Peri-operative conditions and outcomes of operation

4. Preoperative evaluation:

Table 59:

No	Medical Illnesses 1.Yes 2.NO	If Yes, 0.no medical illness 1.DM 2.malnutrion 3.RVI 4.Other	C/C 1.pain 2. swelling 3. fever 4.ulceration 5.other	Pre-op V/S 1.unrecordable BP 2.BP <90/60 3. BP>90/60	Pro-op septic shock 1.Yes 2. NO	Pre-op anemia 1.Yes 2.No

Severity of anemia 0.No anemia 1. mild (11-12.9) 2.moderate(8-10.9) 3.severe(<8)	Radiological investigation 1.Yes 2. No	Pre-op antibiotics 1.Yes 2. No

5. Intra-operative finding

Table 60:

No	Level of Training of surgeon 1.Consultant 2.Resident	Duration of operation	Type of necrotizing fasciitis 1.necrotizing fasciitis 2.myo-necrosis	Anatomic site involved 1.perinium 2.upper extremity 3.lower	Type of operation 1.multilpe incisions 2.amputation 3. debridement	Intra-op vital signs 1.Normal 2.Deranged, specify__	Intra-op blood loss

				extremity 4. torso 5. other			

6. Postoperative outcome

Table 61:

No	Post op complications 1.Yes 2.No	Frequency of Complications o. no complication 1.wound infection 2.septic shock 3.MOF 4.HAP 5.respiratory failure 6. anemia	Frequency of re-debridement	Type of wound closure 1.skin graft 2.wound approximation 3.other	Condition of discharge 1.improved 2.dead If death specify cause____	Cause of death 0.improved 1.MOF 2.septic shock 3.respiratory failure 4. other	Total duration of hospital stay 1.1wk 2.2 wks 3. 3 wks 4. 4 wks 5.5 wks 6. 6 wks 7. 7wks 8. 8wks 9.>8wks

ASSURANCE OF PRINCIPAL INVESTIGATOR

The undersigned agrees to accept responsibility for the scientific ethical and technical conduct of the research project and for provision of required progress reports as per terms and conditions of the collage of public health and medical sciences, department of surgery in effect at the time of grant is forwarded as the result of this application.

Name of student: …….

Date: …… signature: ……

Approval of the first advisor

Name of the first advisor: ……

Date: …… signature: ……