IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 18, Issue 5 Ser. 18 (May. 2019), PP 12-31
www.iosrjournals.org

Laboratory Risk Indicator For Necrotizing Fasciitis(LRINEC)Score-As A Tool For Differentiating Necrotizing Fasciitis From Other Soft Tissue Infections

T.Gunalasuresh[1], Alice priscilla[2]
[1](General surgery,Coimbatore medical college/The Tamilnadu Dr.M.G.R.Medical University,India)
[2](General surgery, Coimbatore medical College/The Tamilnadu Dr.M.G.R.Medical University,India)
Corresponding Author: T.Gunalasuresh

Abstract: *Skin and subcutaneous tissue infections are highly diverse with regard to etiology,predisposing organism,incidence,clinicalfeatures,severity,complications.They may occur as single or recurrent episodes.The spectrum of deep soft tissue infections ranges from localized bacterial,viral and parasitic lesions to rapidly spreading,tissuedesrtructive infections such as necrotizing fasciitis and myonecrosis). In this study,soft tissue infections occur in all age groups.It appears in the age group between 56 to 65 years who had a high risk of noncommunicable diseases like diabetes etc. The next common age group involved is 46 to55 years. It can occur in extremes of age with no age exception. However age beyond 50 years confers the high risk for Necrotizing fasciitis, as evident in this study. LRINEC scoring system has a better positive predictive value in identifying the onset of necrotizing fasciitis and risk strategizing of the patients with severe soft tissue infections.It can be used as an adjuvant in the management of soft tissue infections*

Date of Submission: 16-05-2019 Date of acceptance: 01-06-2019

I. Introduction

Skin and subcutaneous tissue infections are highly diverse with regard to etiology,predisposing organism, incidence, clinical features, severity, complications. They may occur as single or recurrent episodes. The spectrum of deep soft tissue infections ranges from localized bacterial,viral and parasitic lesions to rapidly spreading, tissuedesrtructive infections such as necrotizing fasciitis and myonecrosis.When patient present with soft tissue infection, the clinician faces the challenge of establishing diagnosis and prescribing definitive treatment. Even the experienced clinician may have difficulty in didtiguishing between the different forms of deep soft tissue infections during early stages.Necrotizing soft tissue infections are often fatal,characterized by extensive necrosis of subcutaneous tissue and fascia.Perhaps it is the most severe form of soft tissue infection potentially limb and life threatening.These infection often mistaken for for cellulitis or innocent wound infections and hence,diagnosticdelay.Inspite of advances in antibiotic therapy and intensive care,the mortality of necrotizing soft tissue infection is still high.The reported mortality of 30-40% reflects the inadequacy of early recognition of necrotizing soft tissue infections.This study emphasizes on the search for a tool that reliably and rapidly identifies the patients with NF and helps to decide for earlier effective therapy to modify clinical outcome

II. Material And Methods

This prospective obsrvational study was conducted in Coimbatore medical college hspital from July 2017 to July 2017 among 144 patients admitted to surgical wards with severe soft tissue infections.144 adult subjects (both male and females) of aged ≥ 18, years were for in this study.

Study Design: Prospective open label observational study

Study Location: This was a tertiary care teaching hospital based study done in Department of General surgery ,Coimbatore medical college Hospital, Coimbatore, Tamilnadu.

Study Duration: July 2016 to July 2017.

Sample size: 144 patients.

Sample size calculation: The sample size was estimated on the basis of a single proportion design. The target population from which we randomly selected our sample was considered 20,000. We assumed that the confidence interval of 10% and confidencelevel of 95%. The sample size actually obtained for this study was 96 patients for each group. We planned to include 300 patients (Group I- Control, Group II- Cases of 100patients for each group) with 4% drop out rate.

Subjects & selection method: The study population was drawn from all patients admitted to Coimbatore medical college hospital, surgical wards with severe soft tissue infections.Age,sex,site and etiology of infection,clinicalmanifestations,comorbidities,predisposingfactors,vitalsigns,laboratory parameters at the time of admission and microbiology of woumd and blood culture has been recoreded.culture of pus,aggressive surgical debridement,tissuebiosy,radiologicalimaging,antibiotictherapy,treatment of complication,amputation or skin grafting were strategized for management.The interval between the contact and admission,LRINEC score risk categorization,the time interval between the admission and first surgery,number of procedures,the need for amputation, length of hospital stay and the mortality rate had been documented.All variables were statiscallyanalysed further to evaluate the sgmigicanceod LRINEC score 1 predicting the clinical outcomes

Inclusion criteria:
All patients Aged ≥ 18 years,with severe soft tissue infections

Exclusion criteria:
1. Pregnant women
2. Patients aged <= 18 year old

Statistical analysis

Data was analyzed using SPSS version 20 (SPSS Inc., Chicago, IL). Student's *t*-test was used to ascertain the significance of differences between mean values of two continuous variables and confirmed by nonparametric Mann-Whitney test. In addition, paired *t*-test was used to determine the difference between baseline and 2 years after regarding biochemistry parameters, and this was confirmed by the Wilcoxon test which wasa nonparametric test that compares two paired groups. Chi-square and Fisher exact tests were performed to test for differences in proportions of categorical variables between two or more groups. The level $P < 0.05$ was considered as the cutoff value or significance.

III. Result

In this study,totally 144 patients presenting to our hospital with soft tissue infections were included in this study.On the basis of Laboratory Risk Indicator for Necrotising Fasciitis (LRINEC),they were evaluated.These patients were classified as Low, Intermediate and High Risk for the onset of Necrotising Fasciitis based on their score. In each category ,patients with infections were managed appropriately and their outcomes are tabulated and discussed as below

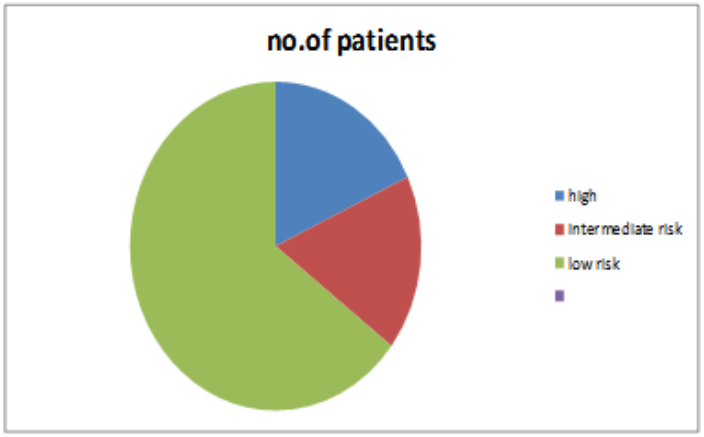
- Laboratory Risk Indicator for Necrotising Fasciitis

Variable	Score
C=reactive protein	
Positive	4
negative	0
Total White cell count,	
<15	0
15 to 25	1
>25	2
Hemoglobin,gm/dl	
>13.5	0
11.5 to 13.5	1
<11.5	2
Sodium.mmol/l	
>=135	0
<135	2
Creatinine	
<=1.6	0
>1.6	2
Glucose,mg/dl	
<=180	0
>180	1

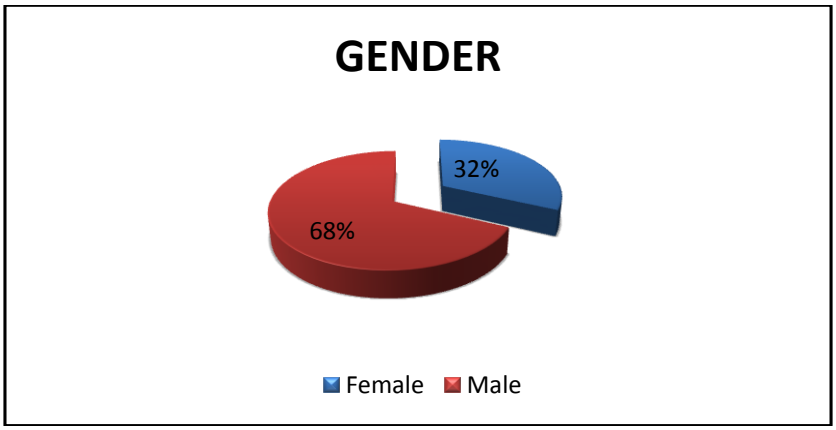
- The score maximum is 13.
- **Based on Score (LRINEC),RISK CATEGORISATION OF PATIENTS**
- The 144 patients in this study were categorised based on the LRINEC stratification as mentioned as below
- **LRINEC SCORE**
- 1.LOW RISK =<6

- 2.INTERMEDIATE RISK>6
- 3.HIGH RISK >8

LRINEC SCORE	NO OF PATIENTS	RISK CATEGORY	
=<6	93	LOW	
>6	26	INTERMEDIATE	
>8	25	HIGH	

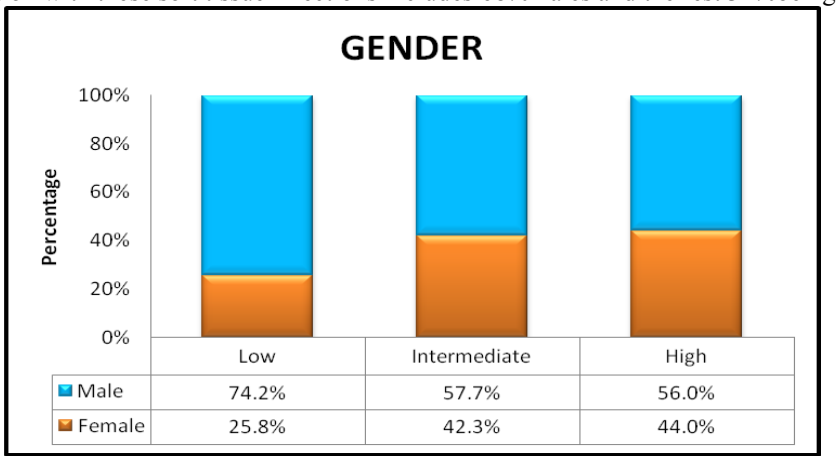


- About 65% of patients with soft tissue infections were categorized as low risk or progression of Necrotizing fasciitis. About 18% and 17% of patients with soft tissue infections were categorized as intermediate and high risk for progression to Necrotizing fasciitis respectively.



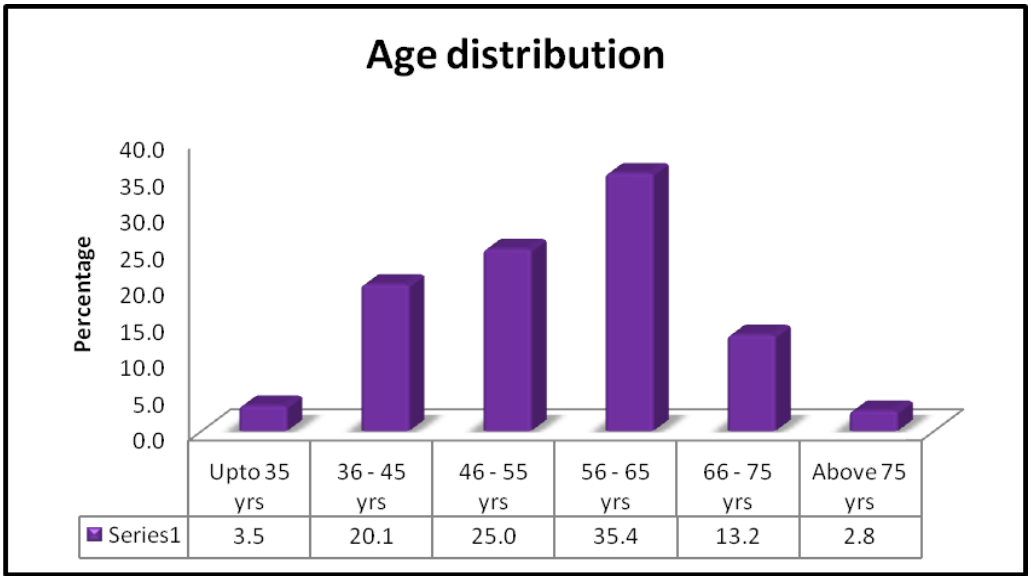
SEX WISE DISTRIBUTION

The study population with these soft tissue infections includes 68%males and the rest 32%being females.



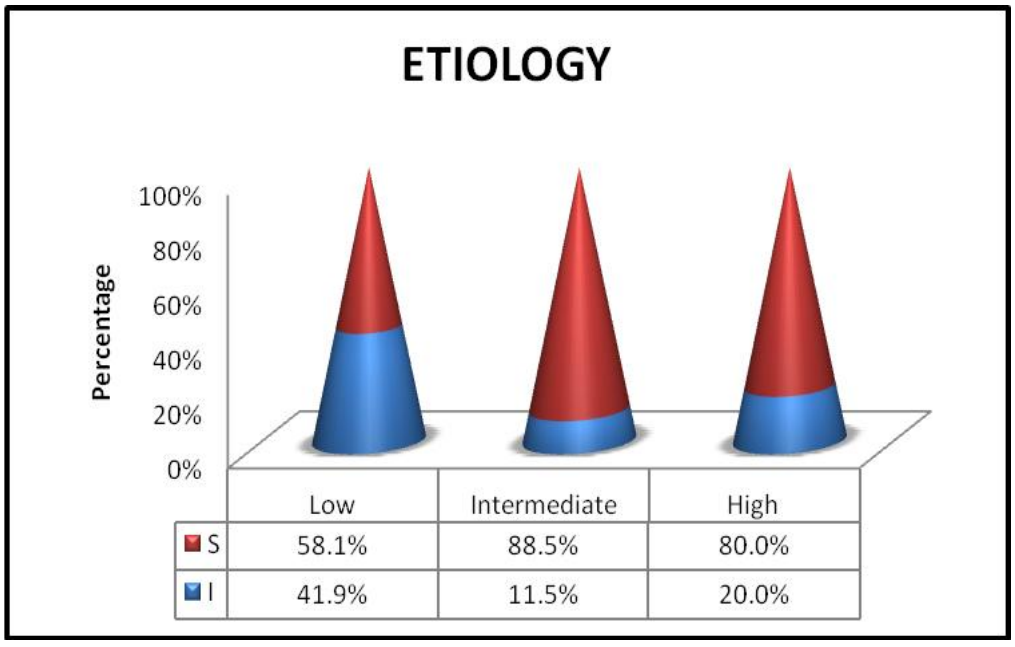
After categorization of study patients into risk groups based on LRINEC score, In low risk, almost 75% are males ant the others being females,and in intermediate and high risk groups,male and female patients have an equal preponderance.

AGEWISE RISK DISTRIBUTION



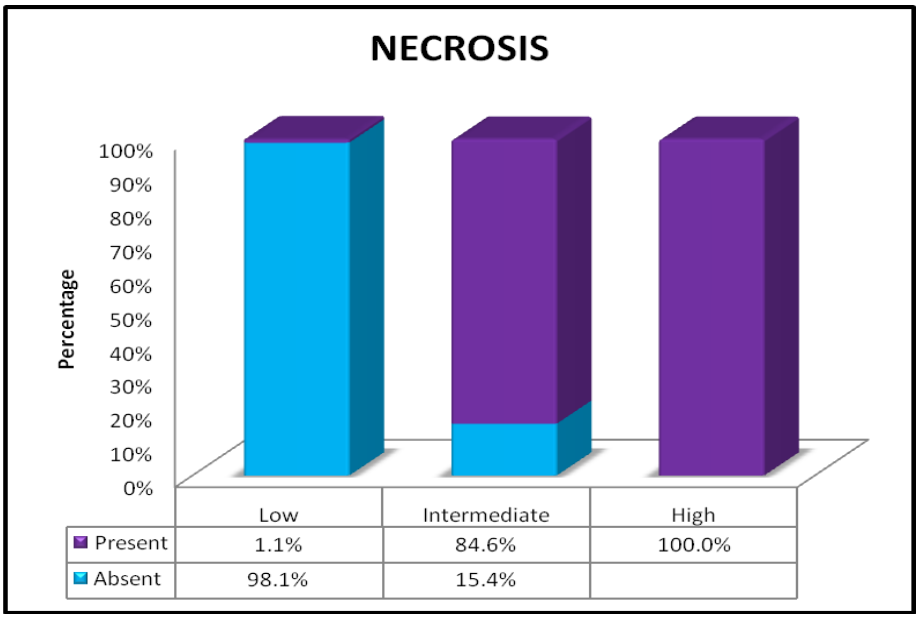
In this study,soft tissue infections occur in all age groups.It appears in the age group between 56 to 65 years who had a high risk of noncommunicable diseases like diabetes etc. The next common age group involved is 46 to55 years. It can occur in extremes of age with no age exception. However age beyond 50 years confers the high risk for Necrotizing fasciitis, as evident in this study.

ETIOLOGY FOR SOFT TISSUE INFECTIONS



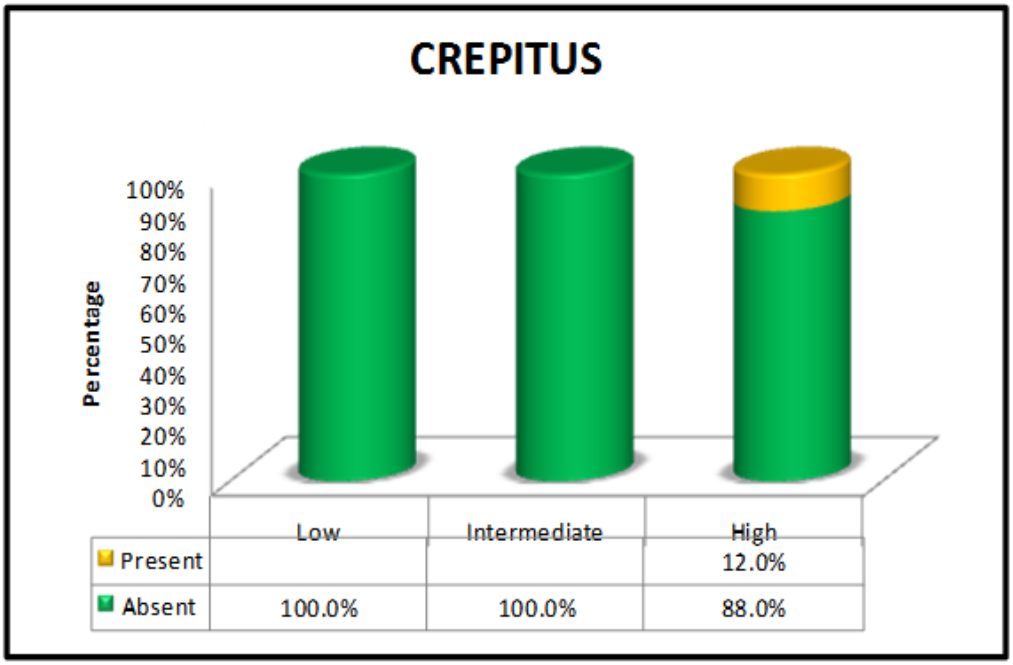
➢ Among the patients studied,in low risk,58.1% of patients had a spontaneous onset of their illness and the other 41.9% had preceding event such as injury more often nail or thorn prick or road traffic accident.in both intermediate and high risk groups, around 80% to 90% of patients had a spontaneous onset. However necrotizing fasciitis is having a spontaneous onset more commonly as proved in this study.

NECROSIS OF TISSUES IN EACH RISK CATEGORISATION



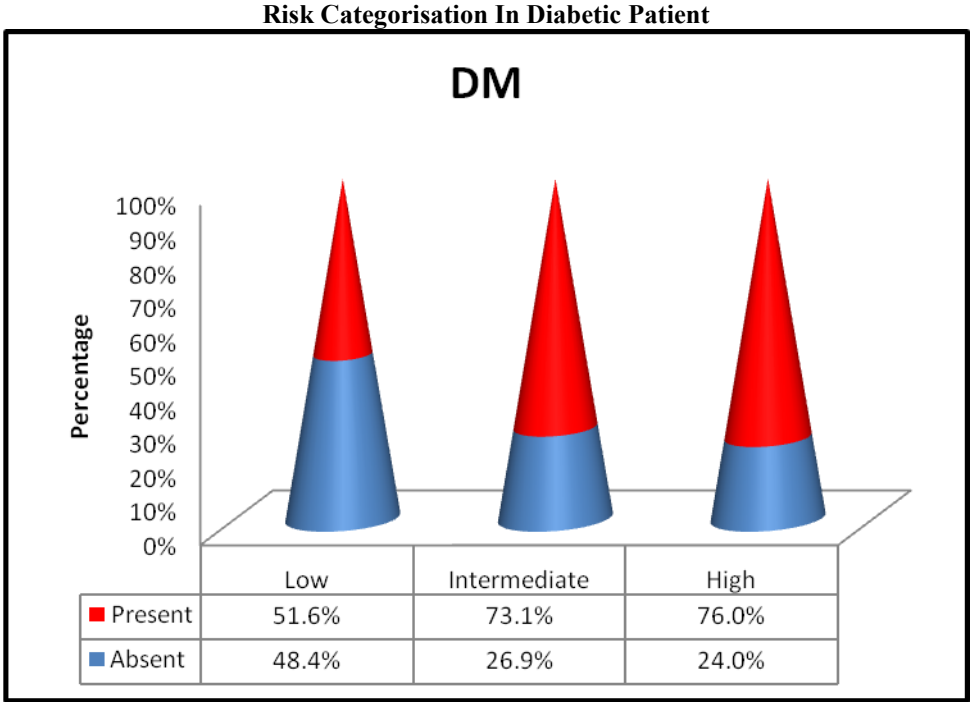
Among the study patients,necrosis of tissues almost absent in low risk patients there is only inflammation. In intermediate groups, about 85% of patients had necrotic tissues and the other 15.4 % had only inflammation but no necrotic tissues.In high risk patients,there was the presence of necrotic tissues in almost 100% of patients.

CREPITUS IN TISSUES IN EACH RISK GROUPS



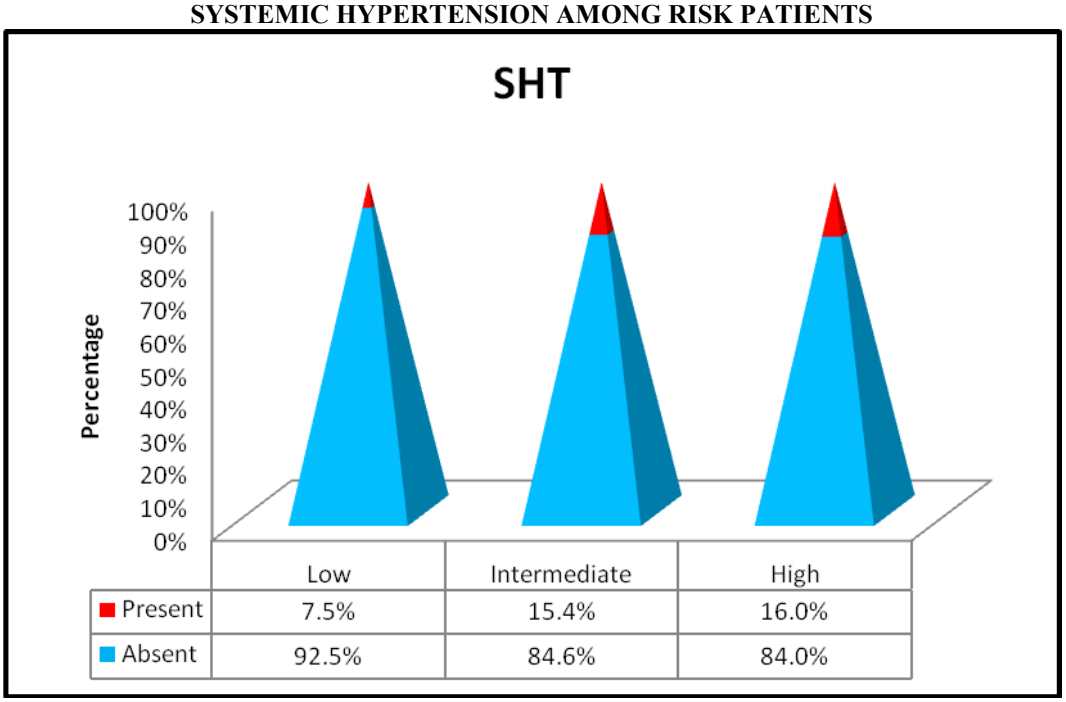
In the study patients , the clinical finding of crepitus is almost absent in both low and intermediate risk groups.in high risk patients around 12% of patients ,crepitus is present in the subcutaneous tissues,suggestive of clostridial infection / gas gangrene. This indicates patients need active intervention in the form of medical and surgical treatment.

Risk Categorisation In Diabetic Patient



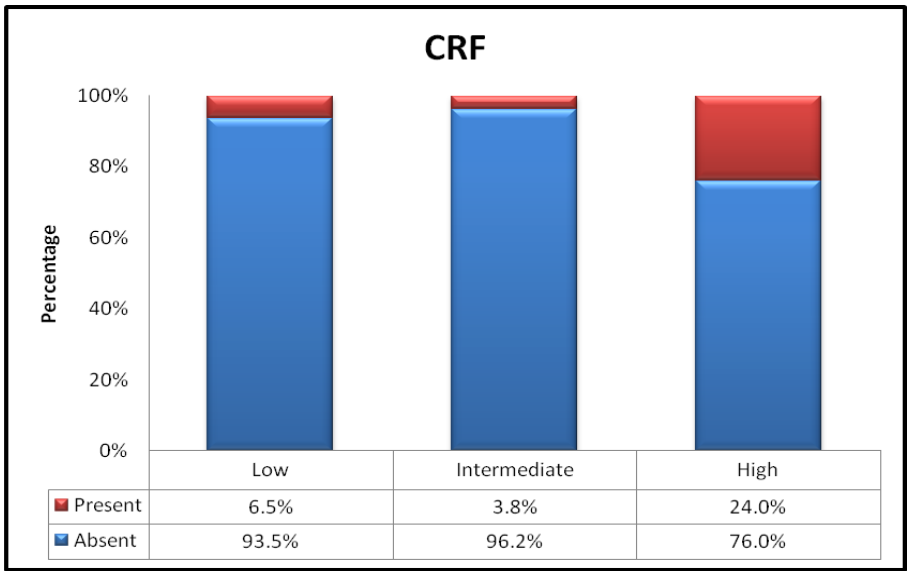
In my study population,around 51% of patients in low risk groups having diabetes, and in both intermediate and high risk almost 75% of patients are having diabetes .By this study we are again proving the presence of diabetes is the important predisposing factor for soft tissue infection and also the progression of infection. High risk groups are found among the diabetic patients.

SYSTEMIC HYPERTENSION AMONG RISK PATIENTS



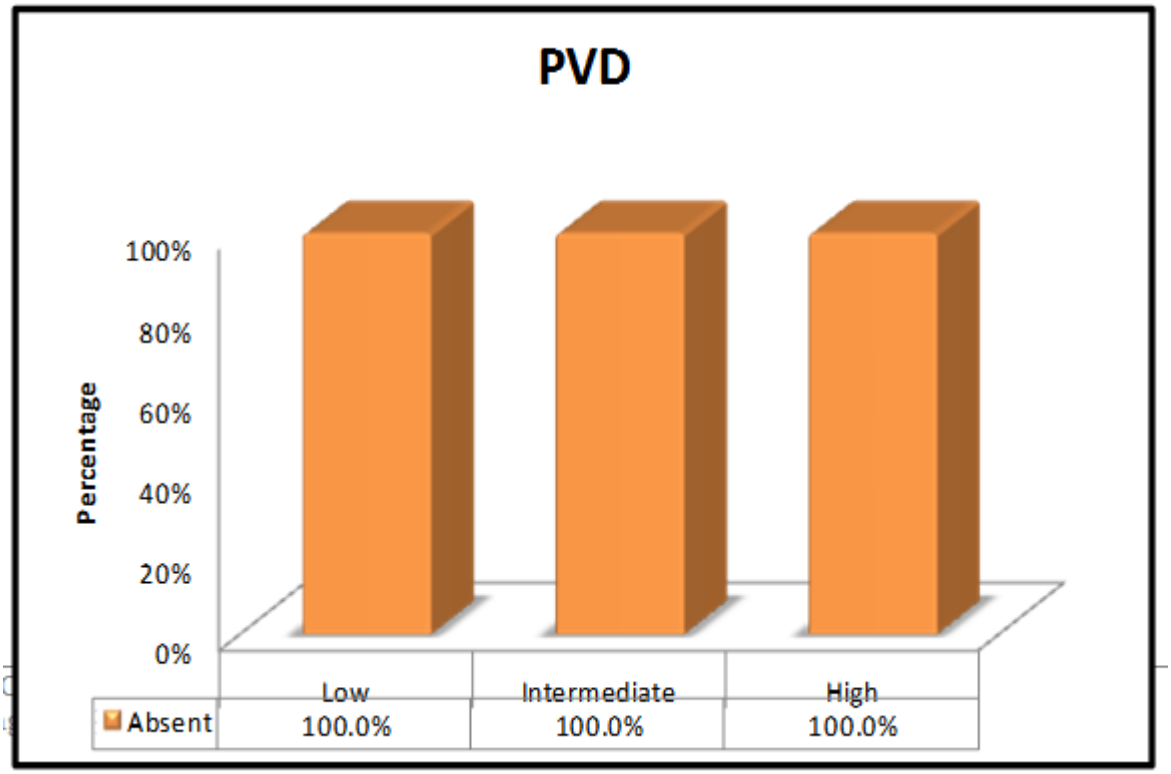
In the study group, in low risk groups,7.5% of patients are having only hypertension.in intermediate and high risk groups around 15% of patients are having hypertension. All others are not having hypertension. This indicates that systemic hypertension alone is not a predisposing factor. When combined with other comorbid conditions, it has some influence in soft tissue infection patients clinical outcomes

CHRONIC RENAL FAILURE AMONG RISK PATIENTS



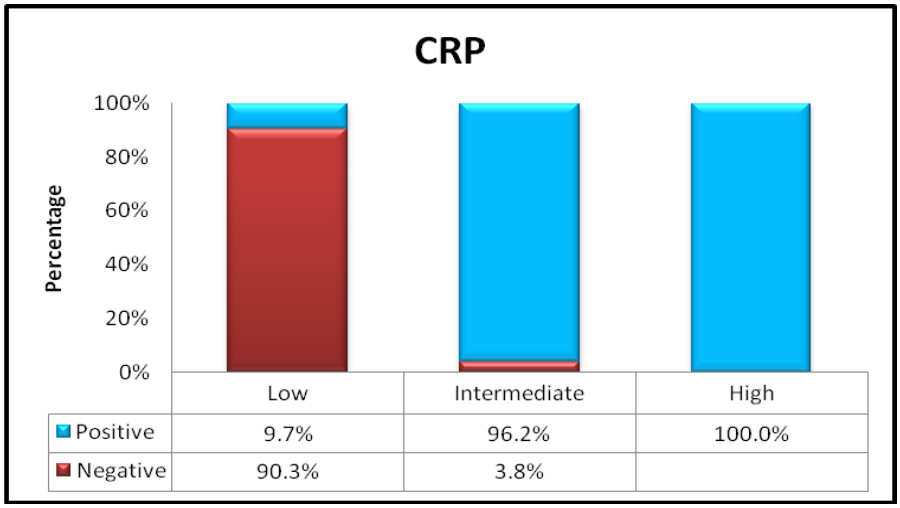
Among the study group,in low and intermediate risk groups,around 4% to 7% of patients having chronic renal failure ,in high risk groups ,chronic renal failure patients are almost 24%.CRF has no much influence in such infections. If coexisted with diabetes ,it is having greater impact in the outcome of disease among the patients.

PERIPHERAL VASCULAR DISEASE AMONG THE RISK PATIENTS

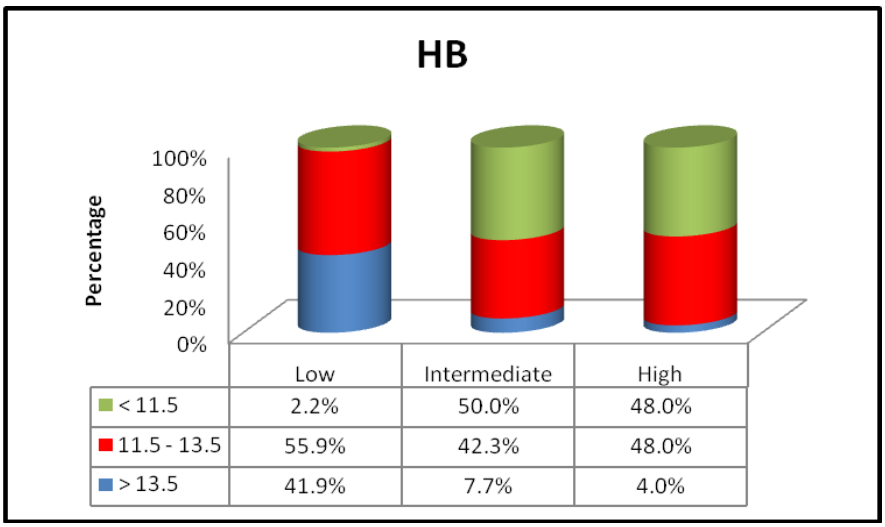


Among the study population ,in all low,intermediate and high risk groups,the incidence of peripheral vascular disease is almost absent. The association between the peripheral vascular disease and the incidence and outcome of soft tissue infections cannot be found.

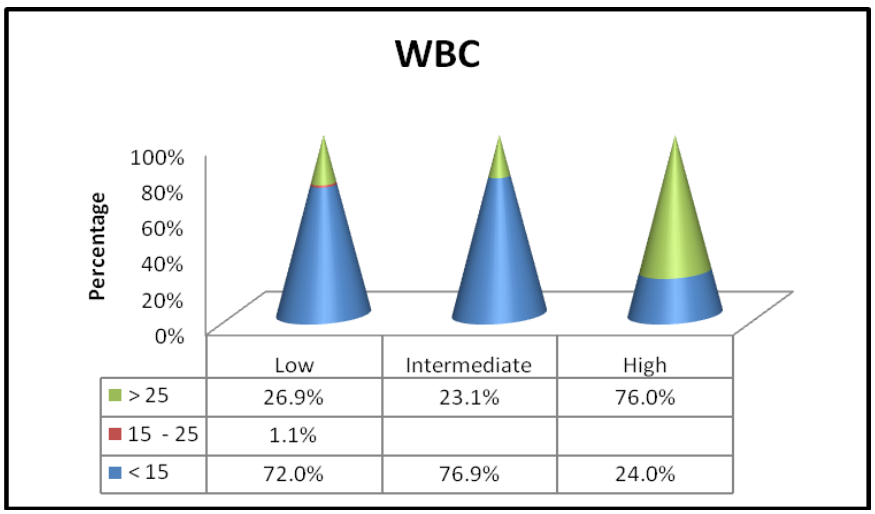
PARAMETERS OF LRINEC IN RISK CATEGORY

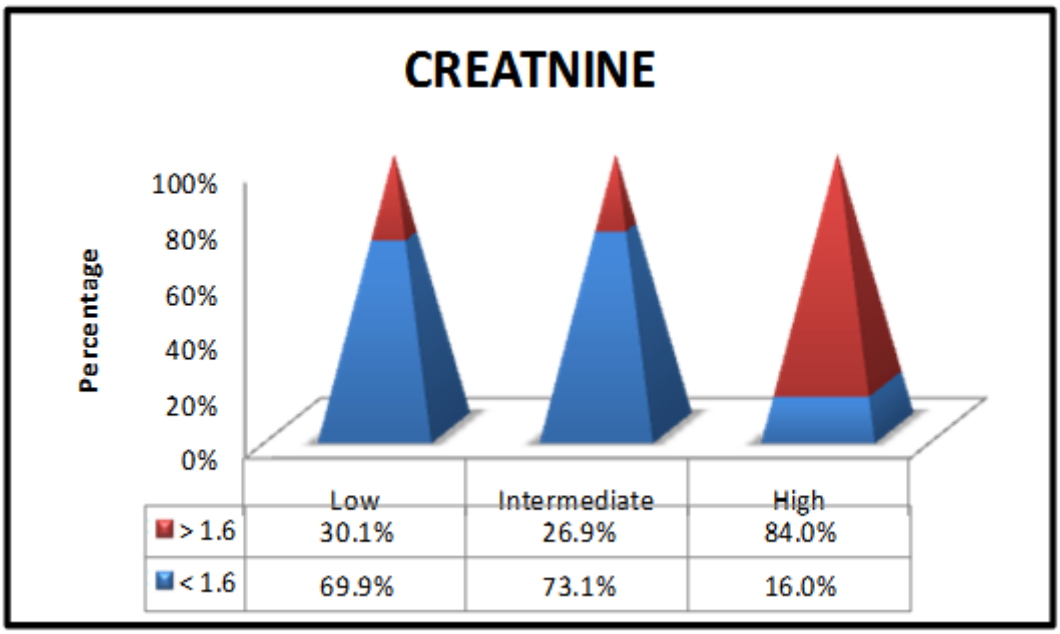


Among these patients ,the CRP will be positive in all high,intermediate and in less than 10% of low risk patients.so CRP is a greater valuable parameter in the score.



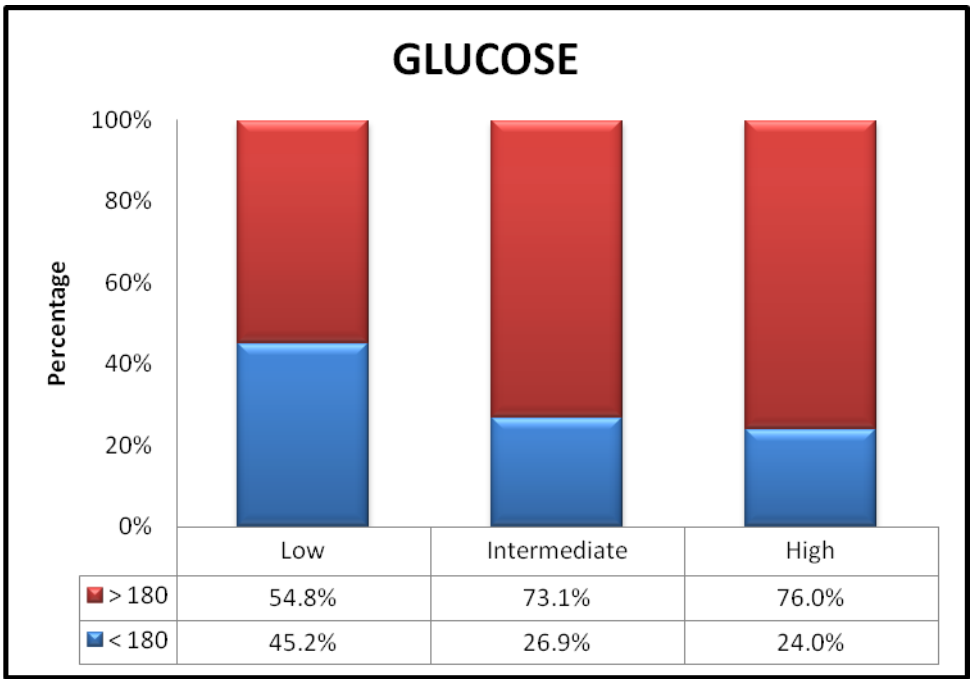
Among the study patients, HB of <11.5gm/dl is present in almost 50% of both intermediate and high risk patients. Almost all the patients in each category had HB of 11.5gm/dl to 13.5 gm/dl.so HB is considered as the important parameter in this score.



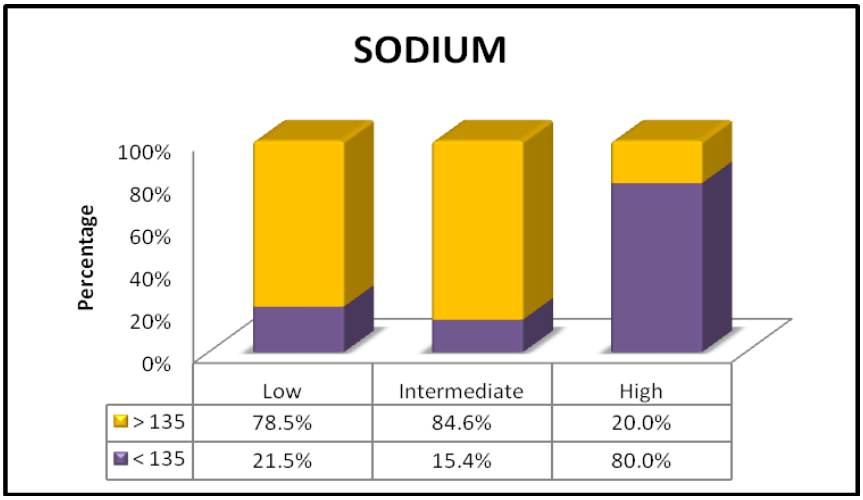


In our study,leukocytosis(white cell count)is the important parameter in this score.leukocytosis is an early indication of sepsis.

In this study, serum creatinine is one of the component parameter .using chi square test ,serum creatinine had a statistically significant value. Soserm creatinine has been taken as a parameter in LRINEC score.

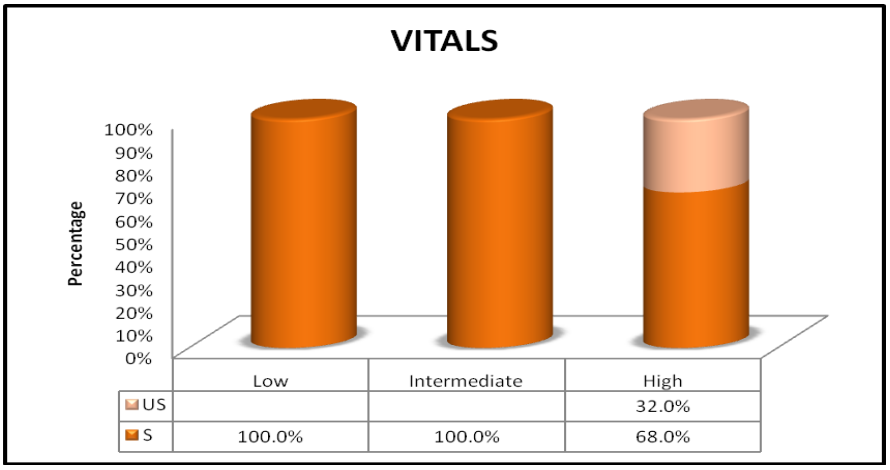


In LRINEC score , patients with soft tissue infections under low intermediate and high risk patients were having 54.8%,73.1%, and 76% of diabetes respectively. So diabetes are an important risk factor for soft tissue infections, so blood glucose levels are the important parameter in LRINEC score and it had a significant p-value using chi-square test.



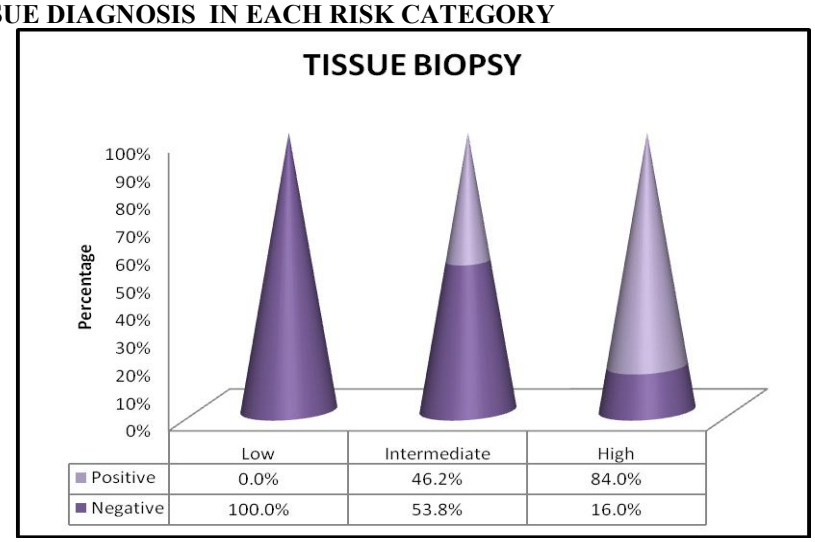
In LRINEC score, serum sodium is one of the important parameter. Using the chi-square test, the calculated value in sodium was found to be statistically significant.So it can be taken as parameter in LRINEC

VITALS AMONG THE RISK PATIENTS



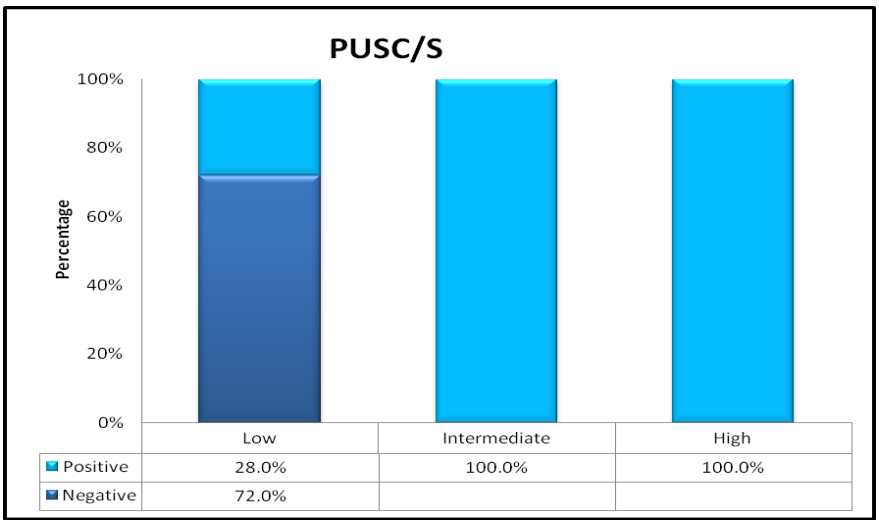
Among the study patients, almost 32% of high risk patients are having unstable vitals at the time of admission.it indicates the need for early resuscititation of patients by giving vasopressors and iv fluids and broad spectrum antibiotics,frequent vitals monitoring are important. Vitals at the time of admission indicates the outcome of high risk patient

POSITIVE TISSUE DIAGNOSIS IN EACH RISK CATEGORY



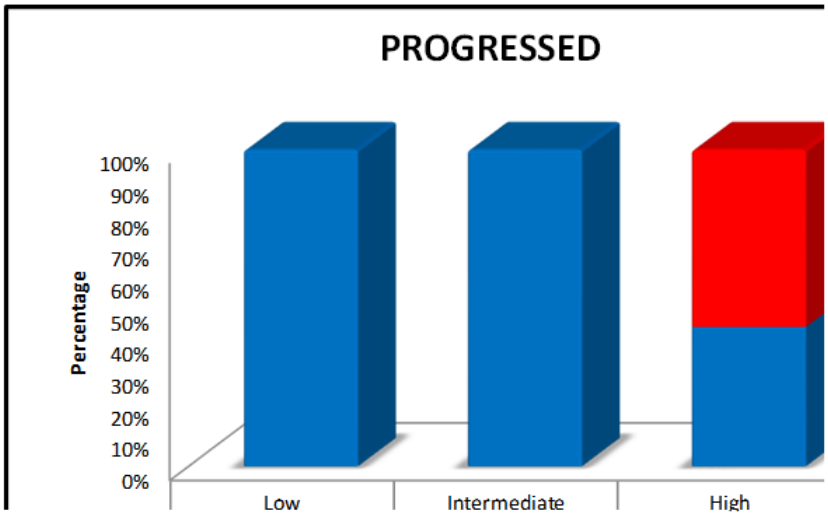
Among the study groups,tissue diagnosis is positive in around 85% of high risk patients based on LRINEC. This score had a highest sensitivity and less than half of patients in intermediate risk groups ,had a positive diagnosis.this indicates that the intermediate group patients had an increased risk of progression to full blown necrotising fasciitis.in low risk groups , none of the patients had positive tissue diagnosis and this signifies that this score had a high specificity.

- PUS CULTURE AND SENSTIVITY IN EACH CATEGORY



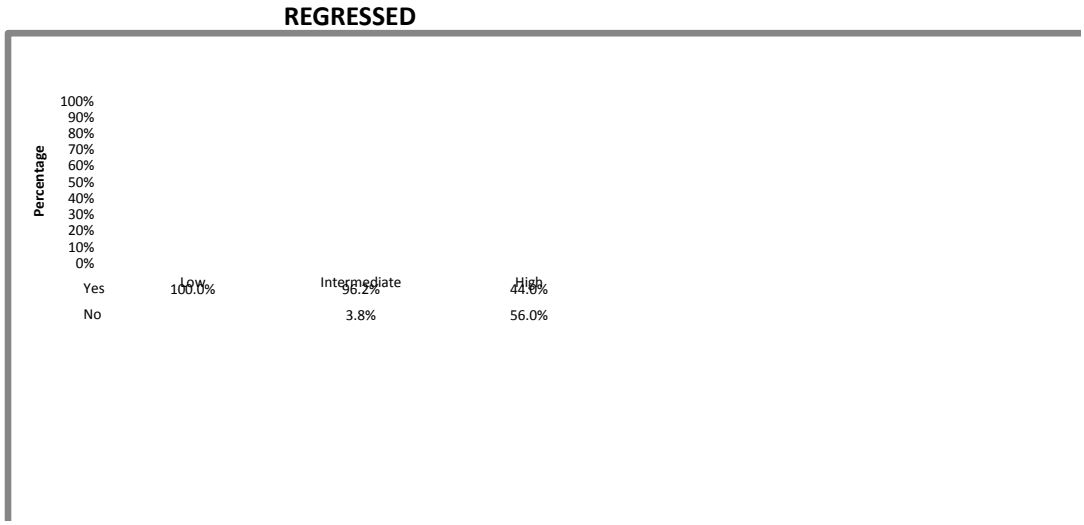
Almost in my study
Population ,pus c/s had a organism growth in both intermediate and high risk patients and in low risk patients,pus c/s are positive for around 30% of patients,and other patients had more features of inflammation,especially in cellulitis.

OUTCOME – PROGRESSION OF INFECTION AMONG THE HIGH RISK GROUPS



In the study,the low and intermediate groups with medical and surgical debridement was not found to get progressed ,they are improving with our treatment .But almost 56% of patients had progression of disease even with treatment. And these patients had further surgical debridement or inorder to prevent mortality, amputation.

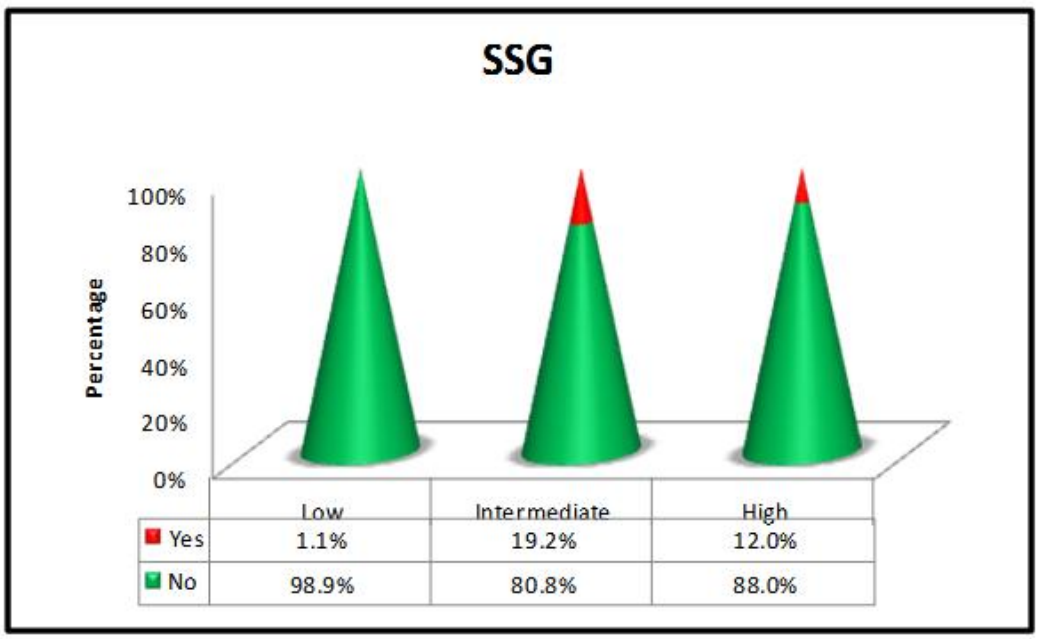
OUTCOME – REGRESSION OF INFECTION IN THE STUDY PATIENTS



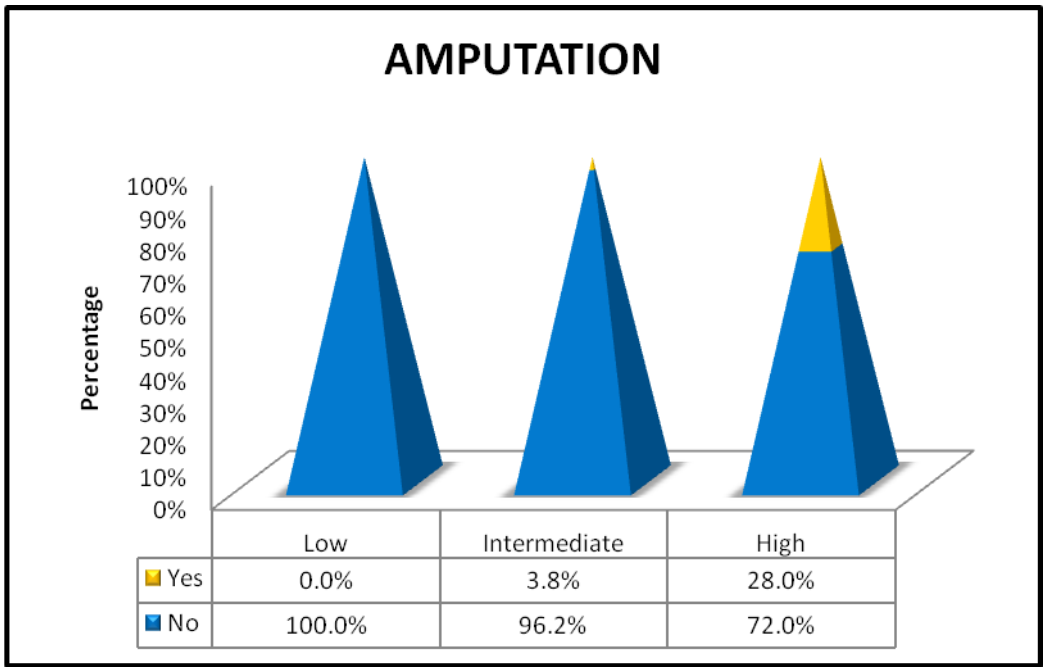
Among the study group ,almost 100% of patients in the low risk group showed the regression of infection.In the intermediate group,after medical and surgical treatment these patients also showed regression to 96.2% The high risk patients only 44% had the regression of infection after treatment. The other 56% of patients among the high risk patient showed no regression of infection. This emphasises the patient was going in need for removing the septic and necrotic tissue in the form of amputation to prevent mortality

SSG after debridement in each group

The study population , the role of SSG in each category after debridement,in low risk category,in most of the cases there was no necrotic tissues, so there was no need for debridement and there was no development of raw area. In low risk group, only 1.1% of patients had undergone SSG. In intermediate and high risk groups ,19.2% and 12% of patients respectively had undergone SSG after debridement.

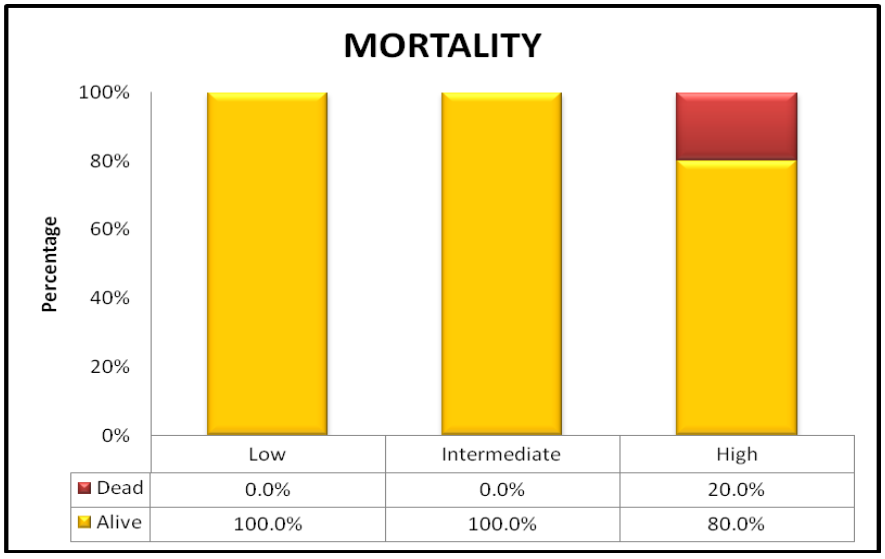


AMPUTATION RISK AMONG EACH GROUP



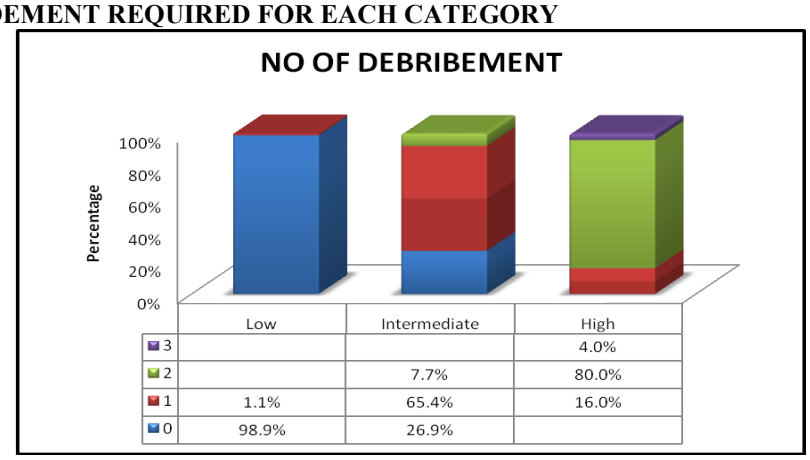
Among the study group,in low risk group,there is no role of amputation as a life saving procedure. In intermediate group,almost most of the casesaround 97% of patients had a limb salvageable surgeries and only 3% had amputation.J In high risk group,inorder to preventgeneralisedsepticaemia and mortality. almost 28% of patients had amputation risk and the remaining 72% of patients had a limb salvageable surgeries.

Mortality among the Risk Category



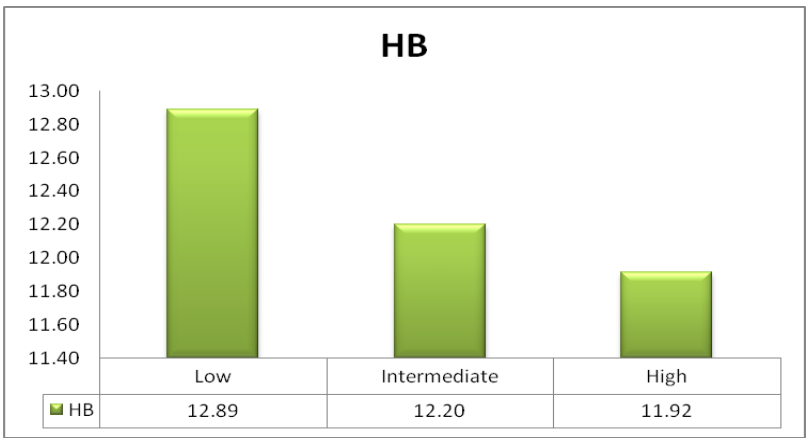
In the study population ,the percentage of mortality is calculated in each risk group .in low and intermediate risk group patients got better with the management and there is no mortality. In high risk group,there is 20% mortality even with treatment and 80% of patients were saved,eventhough they had a serious complications of infection and septicaemia.

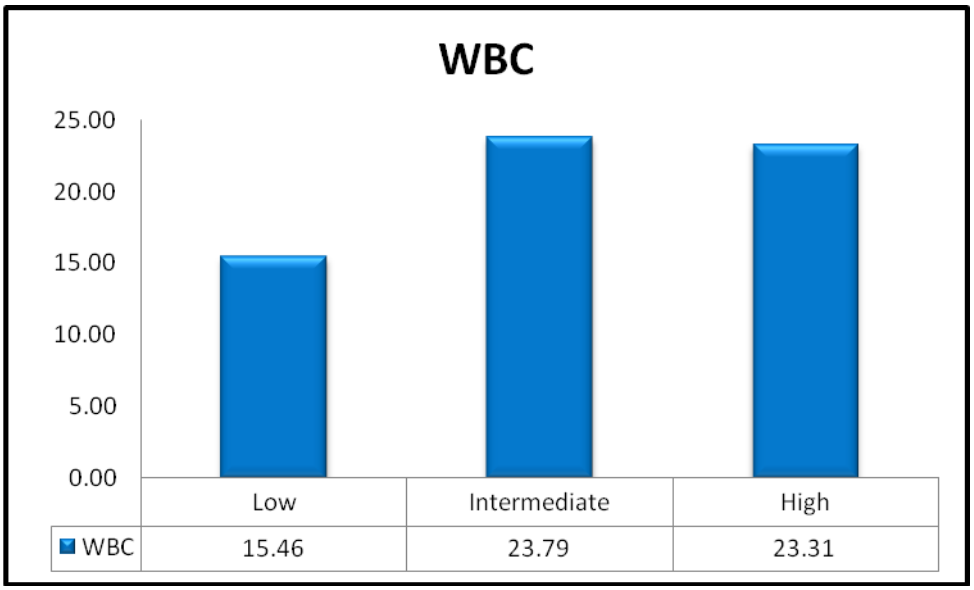
NO OF DEBRIDEMENT REQUIRED FOR EACH CATEGORY

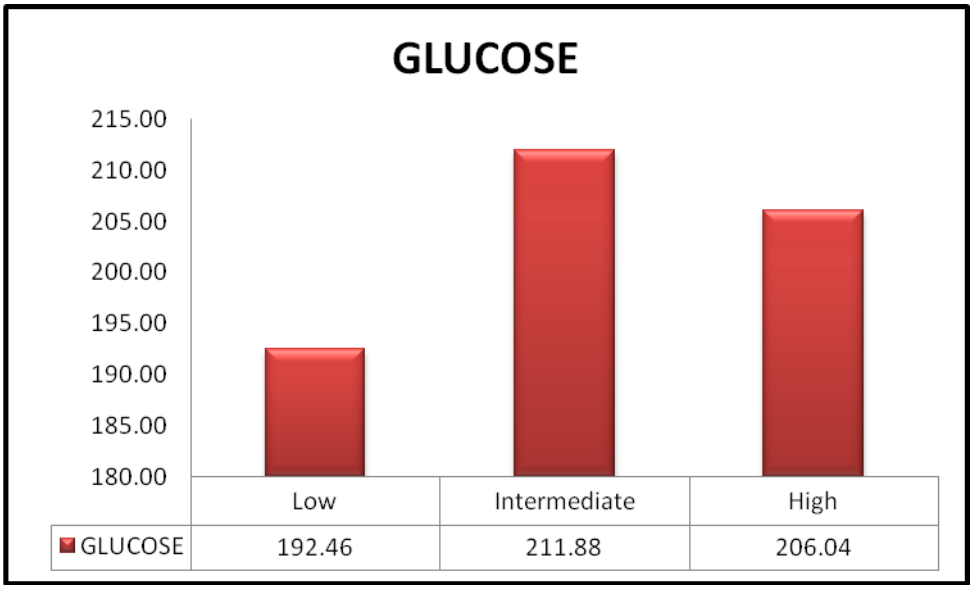


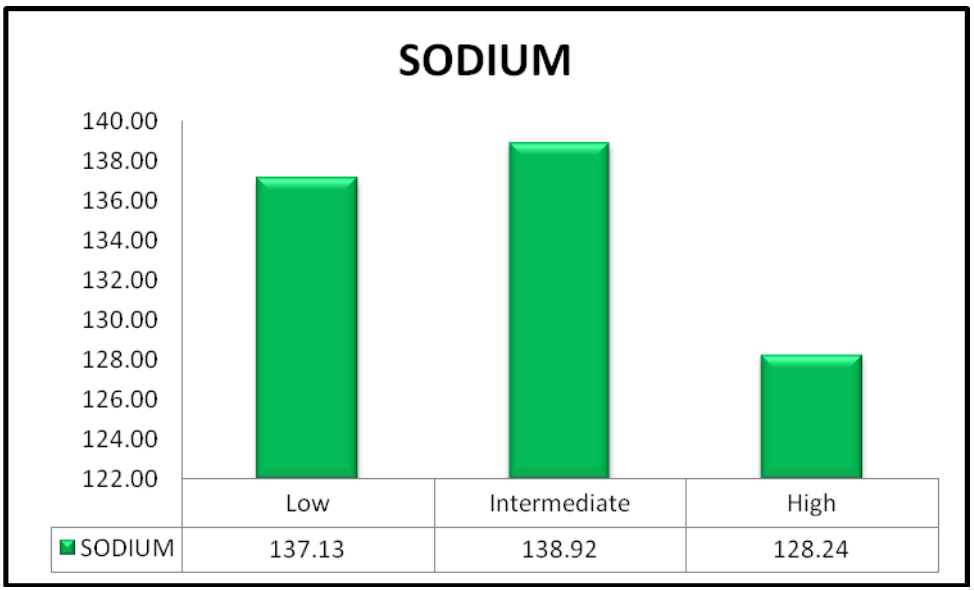
Among the study patients, patients under high risk category group need higher number of debridements than the other risk groups. Almost98% of patients in low risk category need conservative management,with other 1% of patients requiring few debridement.Patients under intermediate groups hadupto2 debridements to prevent the regression of infection. Patients under low risk category need regular dressing not the extensive debridement only few require It.

THE MEAN VALUE OF EACH PARAMETERS IN EACH CATEGORY AS SHOWN IN THE BELOW DIAGRAM









TAB.4 P-VALE OF THE PARAMETERS OF LRINEC SCOREANOVA

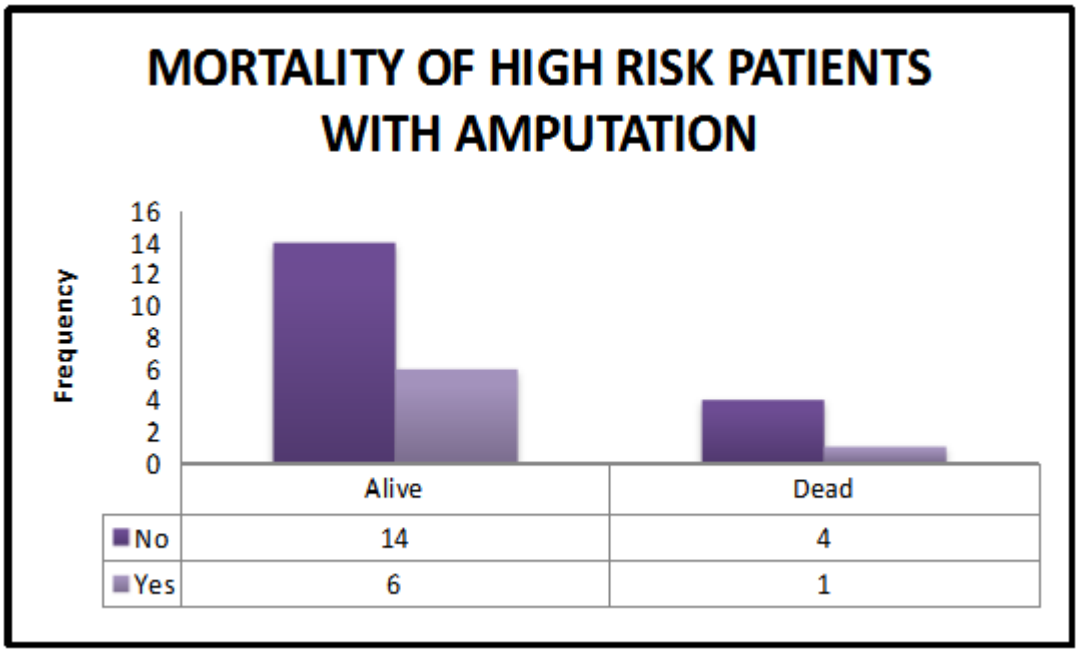
		Sum of Squares	df	Mean Square	F	Sig.
HB	Between Groups	23.576	2	11.788	4.635	.011
	Within Groups	358.611	141	2.543		
	Total	382.187	143			
WBC	Between Groups	2159.888	2	1079.944	56.883	.000
	Within Groups	2676.958	141	18.986		
	Total	4836.846	143			
CREATININE	Between Groups	5.459	2	2.729	15.015	.000
	Within Groups	25.630	141	.182		
	Total	31.089	143			
GLUCOSE	Between Groups	9464.928	2	4732.464	2.084	.128
	Within Groups	320196.732	141	2270.899		
	Total	329661.660	143			
SODIUM	Between	1844.969	2	922.484	18.569	.000

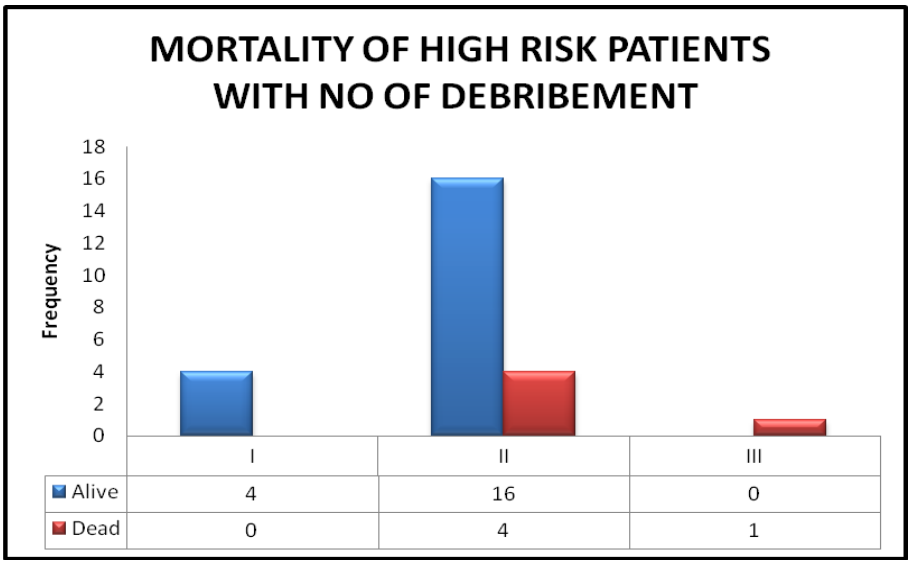
	Groups					
	Within Groups	7004.858	141	49.680		
	Total	8849.826	143			
DURATION OF HOSPITAL STAY	Between Groups	1578.160	2	789.080	109.097	.000
	Within Groups	1019.833	141	7.233		
	Total	2597.993	143			

MORTALITY AMONG THE HIGH RISK GROUP AFTER AMPUTATION

In the study population , the high risk patients did not show regression of disease even after debridement of necrotic and septic tissues,theydevelopedsepticaemia due to persistent septic foci. Inorder to prevent mortality,we did amputation of the affected part/limb and we saved the patient .in my study,among 25 high patients,20 patients were saved including 5 patients who have undergone amputation.5 patients lost their lives, including 1 amputated patient,mortaliy risk gets decreased after amputation.

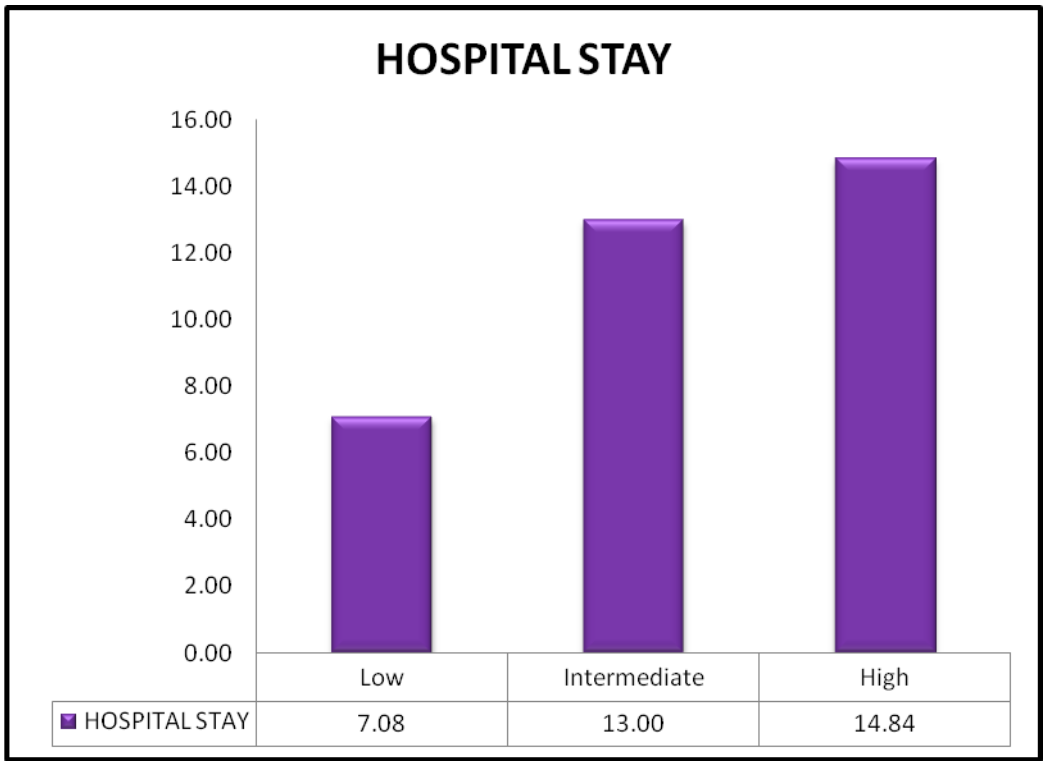
MORTALITY OF HIGH RISK PATIENTS AFTER DEBRIDEMENT





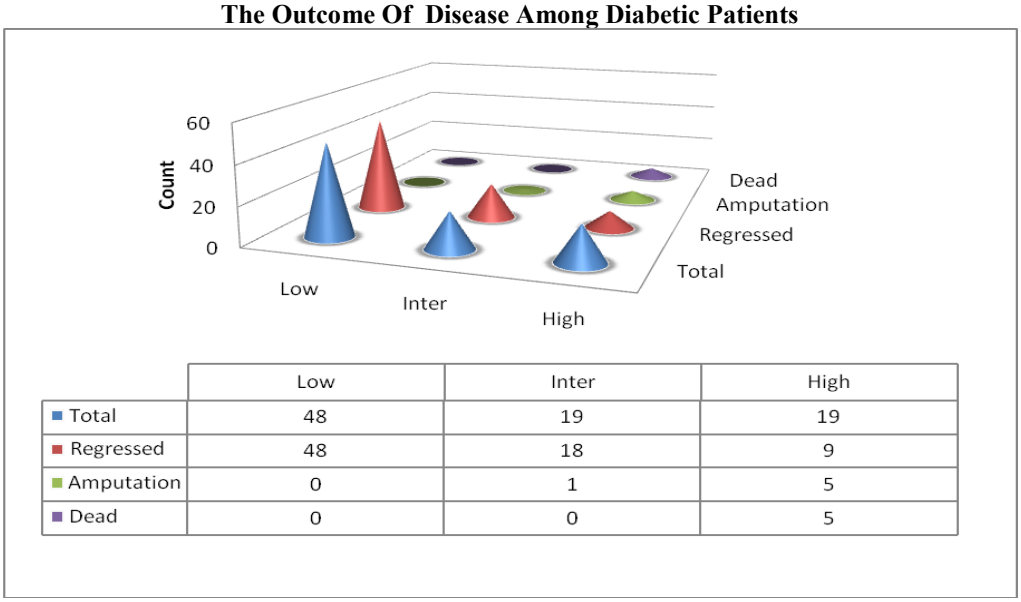
Among the study population,few high risk patients showed progression of disease after debridement. After two debridement,among the 24 patients, 20 patients were showed the regression ,and they were saved,and only 4 patients were dead .after three debridement, one patient was dead.so mortality is more in patients after debridement compared to amputation.

THE AVERAGE DURATION OF HOSPITAL STAY IN EACH CATEGORY



Among the patients, duration of hospital stay is more in high risk patients and intermediate patients the low risk groups.The mean duration of hospital stay is 7 days ,intermediate and high risk groups is 13 to 15 days.

The Outcome Of Disease Among Diabetic Patients



	Low	Inter	High
Total	48	19	19
Regressed	48	18	9
Amputation	0	1	5
Dead	0	0	5

In this study there are 48 diabetic patients in low risk group, among them,all the patients showed the disease regression with the medical and surgical treatment. Among the 19 diabetic patients in the intermediate risk group,18 patients showed the regression of the disease only one had the progression of the disease and had

amputation and no mortality. In high risk group, 19 diabetic patients , 9 of them showed the regression of the disease and 5 of them had amputation without mortality. And the remaining 5 of them were dead with rapidly progression of the disease. Hence diabetic patients were more prone for necrotizing fasciitis and they were having the high mortality rate .

IV. Discussion

Necrotizing soft tissue infections are fatal progressive infectious processes, most prevalent among diabetic patients, impoverished obese diabetic patients and injection drug users with a varied spectrum of clinical course associated severe sepsis. The associated systemic inflammatory response syndrome in the setting of sepsis causes changes in the biochemical parameters in apredictable manner.

- The LRINEC score is a measure of these changes and predicts the presence of necrotizing fasciitis. Other soft tissue infections (eg.cellulitis and abscesses) rarely cause an inflammatory state severe enough to cause such disturbances in the laboratory variables.
- This Prospective study of 144 patients with soft tissue infections included ninety eight females (68%0 and forty six females (32%). The mean age group was around 56 to 65 years. Diabetes Mellitus was the most common comorbidity(86 cases).Other comorbid conditions included Chronic Renal Failure (13 cases),Systemic Hypertension (15 cases),Peripheral Vascular Disease 90 cases).The important manifestations at presentation wereerythema,edema, tenderness, bullae, necrosis, tachycardia and hypotension. Extremity was the most common site involved followed by scrotum and perineum. About 97 cases (67%) had soft tissue infections of unknown origin and the remaining 47 cases(33%) were attributed injury as a cause

TAB.5. The characteristics of the study group under low risk category

RISK CATEGORY	NO OF CASES	TISSUE DIAGNOSIS		PUS C/S		DM		SHT		CRF		ETIOLOGY	
LOW RISK	69 MALES & 24 FEMALES	+	0	+	27	+	48	+	7	+	6	S	54
		_	93	_	67	_	45	_	86	_	87	I	39

Treatment given:

- 83 cases were treated conservatively and 10 cases were debrided.no cases were taken for amputation. Most of the cases were treated with intravenous antibiotics. SSG was done for the debrided 10 cases

Outcome

All cases were improved

TAB 6.THE CHARACTERISTICS OF THE STUDY UNDER INTERMEDIATE RISK CATEGORY

RISK CATEGORY	NO.OF CASES	TISSUE DIAGNOSIS		PUS C/S		DM		SHT		CRF		ETIOLOGY	
INTERMEDIATE RISK	15 MALES & 11 FEMALES	+	12	+	26	+	19	+	4	+	1	S	23
		_	14	_	0	-	7	_	22	_	25	I	3

- Treatment Given:
- 19 cases were debrided and 5 cases were treated with SSG. One case was taken for amputation who showed the progression of the disease even after debridement. Rehabilitative measures were started
- Outcome
- All the cases were improved

TAB 7. THE CHARACTERISTICS OF THE STUDY UNDER HIGH RISK CATEGORY

RISK CATEGORY	NO OF CASES	TISSUE DIAGNOSIS		PUS C/S		DM		SHT		CRF		ETIOLOGY	
HIGH RISK	14 MALES & 11 FEMALES	+	21	+	25	+	19	+	4	+	6	S	20
		_	4	_	0	_	6	_	21	_	19	I	5

- Treatment given:
- All cases were debrided and 3 cases were treated with SSG. 7 cases were amputated who had showed the progression of the disease in order to prevent septicaemia and its complications.

- Outcome
- 5 cases were dead and the other cases were saved with debridement or with amputation.
- Sensitivity and specificity
- LRINEC scoring system has a better sensitivity and positive predictive value value in identifying the onset of Necrotizing fasciitis in soft tissue infections
- Of all the comorbidities ,Diabetes Mellitus was the most frequent predisposing factor followed by the Chronic renal failure in both primary and secondary NF in this study group.

TAB 8.CHARACTERISTICS IN PATIENTS WITH LRINEC SCORE<6 AND PATIENTS WITH >=6

Variables	LRINEC<6	LRINEC>=6	p-VALUE
MALE SEX	69	29	0.102
NECROSIS	10	51	0.000
CREPITUS	0	3	0.001
VITALS UNSTABLE	0	8	0.000
UNKNOWN ETIOLOGY	54	43	0.005
DM	48	38	0.011
CRF	6	7	0.015
SHT	7	8	0.308
PVD	0	0	0
NO OF DEBRIDEMENT	0/1/2	1/2/3	0.00
AMPUTATION	0	8	0.000
MORTALITY	0	5	0.002

- (p- value can be calculated by using Fischers exact and Pearson chi square methods)
- In the above table , the p-value (0.011) reveals that there is an association between Diabetes and the severity of risk. The proportion of high/intermediate risk is more in DM group compared to the nondiabetic group. The p-value (0.000) shows that there is an association between the risk of amputation and high risk. The high risk patients are at more for going to the procedure of amputation.
- The p-value (0.000) states there is an relation between the scoring and the risk of mortality. High risk patients had a more chance of going to the complications and death. The cut off of LRINEC >= 6 has better sensitivity and specificity in identifying the risk of the patient.

Bacteriological studies

- In this study, pus culture and sensitivity was taken before giving antibiotics for all the admitted soft tissue infection patients. The reports were collected after 48 hours or more. The collected data was analysed. The most commonly isolated organisms were Streptococci, E.coli, Staphylococcus, Bacteroides, Klebsiellapneumonea, Pseudomonas aeruginosa. The most commonly present organism in the diabetic patients is E.coli. According to the sensitivity to the antibiotics , patients were treated.

V. Conclusion

- Necrotizing soft tissue infections are often fatal, characterised by extensive necrosis of the fascia and subcutaneous tissues. It is perhaps the most severe form of soft tissue infection potentially limb and life threatening. Early diagnosis of necrotizing fasciitis is essential to advocate timely management for the better wellbeing of the patient.
- LRINEC –Laboratory Risk Indicator for Necrotizing Fasciitis score is based on routine laboratory investigations that are readily available, at most centres that can help distinguish Necrotizing fasciitis from other soft tissue infections.
- LRINEC scoring system has a better positive predictive value in identifying the onset of necrotizing fasciitis and risk strategizing of the patients with severe soft tissue infections.
- There is statistically significant association between Diabetic Mellitus and the severity of risk.
- The significance of LRINEC score in predicting the clinical outcome of the patient can also be outlined in this study and as well as the mortality
- Further studies are needed to determine whether additional interventions targeted to the high mortality risk group can lead to improved outcomes.
- Finally Laboratory Risk Indicator for Necrotizing fasciitis (LRINEC) score can be used as an adjuvant in the management of soft tissue infections especially in secondary care hospitals and may prevent delayed referral to tertiary centres where experienced surgeons ,infectious diseases and specialists may guide immediate operative and ancillary management ,thereby improving the clinical outcome of the patient.
- Finally Laboratory Risk Indicator for Necrotizing fasciitis (LRINEC) score can be used as an adjuvant in the management of soft tissue infections especially in secondary care hospitals and may prevent delayed

referral to tertiary centres where experienced surgeons ,infectious diseases and specialists may guide immediate operative and ancillary management ,there

VI. Conclusion

LRINEC scoring system has a better positive predictive value in identifying the onset of necrotizing fasciitis and risk strategizing of the patients with severe soft tissue infections.It can be used as an adjuvant in the management of soft tissue infections, in secondarycare hospitals and may prevent delayed referral to tertiary centres where experienced surgeons, specialists may guide immediate operative and ancillary managemen, thereby improving the the clinical outcome of the patient

References

[1]. National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (AdultTreatment Panel III) Third report of the national cholesterol education program (NCEP) expert panel on detection, evaluation, and treatment of highblood cholesterol in adults (adult treatment panel III) finalreport. Circulation. 2002;106(25, article 3143).
[2]. Bener A, Zirie M, Janahi IM, Al-Hamaq AOAA, Musallam M, Wareham NJ.Prevalence of diagnosed and undiagnosed diabetes mellitus and its risk factorsin a population-based study of Qatar. Diabetes Research and Clinical Practice. 2009;84(1):99–106.
[3]. Bener A, Zirie M, Musallam M, Khader YS, Al-Hamaq AOAA. Prevalence ofmetabolic syndrome according to adult treatment panel III and internationaldiabetes federation criteria: a population-based study. Metabolic Syndrome and Related Disorders. 2009;7(3):221–230
[4]. Bener A, Dafeeah E, Ghuloum S, Al-HamaqAOAA.Association between psychological distress and gastrointestinal symptoms in type 2 diabetes mellitus. World Journal of Diabetes. 2012;3(6):123–129
[5]. Brunzell JD, Davidson M, Furberg CD, et al. Lipoprotein management inpatients with cardiometabolic risk:consensus statement from the American diabetes association and the american college of cardiology
[6]. foundation.Diabetes Care. 2008;31(4):811–822
[7]. Colhoun HM, Betteridge DJ, Durrington PN, et al. Primary prevention of cardiovascular disease with atorvastatin in type 2 diabetes in the collaborative atorvastatin diabetes study (CARDS): multi centrer trial. The Lancet. 2004; 364(9435) :685–696.
[8]. Shepherd J, Barter P, Carmena R, et al. Effect of lowering LDL cholesterol substantially below currently recommended levels in patients with coronary heart disease and diabetes: the treating To new targets (TNT) study.Diabetes Care. 2006;29(6):1220–1226.
[9]. American Diabetes Association.Standards of medical care in diabetes. Diabetes Care. 2009;32(supplement 1):S13–S61.
[10]. Henry RR. Preventing cardiovascular complications of type 2 diabetes: focus on lipid management. Clinical Diabetes.
[11]. Jones PH, Davidson MH, Stein EA, et al. Comparison of the efficacy and safety of rosuvastatin versus atorvastatin, simvastatin, and pravastatin across doses (STELLAR* trial) American Journal of Cardiology.2003;92(2):152–160.
[12]. Group EUROASPIREIIS: Lifestyle and risk management and use of drug therapies in coronary patients from 15 countries.
[13]. Principal results from EUROASPIRE II. Eur Heart J 2001,22:554-572.
[14]. Schuster H, Barter PJ, Cheung RC, Bonnet J, Morrell JM, Watkins C, Kallend D, Raza A, for the MERCURY I Study Group: Effects ofswitching statins on achievement of lipid goals: MeasuringEffective Reductions in holesterol
[15]. Using Rosuvastatin Therapy (MERCURY I) study. Am Heart J 2004,147:705-713.
[16]. Pharmaceutical Management Agency. Prescription for pharmacoeconomic analysis: methods for cost-utility analysis.

T.Gunalasuresh. "Laboratory Risk Indicator For Necrotizing Fasciitis(LRINEC)Score-As A Tool For Differentiating Necrotizing Fasciitis From Other Soft Tissue Infections." IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), vol. 18, no. 5, 2019, pp 12-31.