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Predicting Severity of Acute Pancreatitis Using Neutrophil-Lymphocyte Ratio

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Abstract:
Background*: Acute pancreatitis is the most common inpatient principal gastrointestinal diagnosis.Acute pancreatitis is usually a self limiting process;however 25% of patients with the disease subsequently develop a severe form of the disease that is associated with a mortality upto 50%. The Neutrophil Lymphocyte Ratio(NLR) is a measure of the divergence of these two white cell count{WCC} components i.e lymphocytes and neutrophils,which may be more accurate than the total WCC or individual neutrophil/lymphocyte counts in predicting severity in patients with acute pancreatitis.*
Materials and Methods*:This study is an hospital based observational study donein patients diagnosed with acute pancreatitis in ward and ICU in the Department of General Medicine during july 2022 to december 2022 ,at Maharajahs insitiute of medical sciences,Vizianagaram,Andhra pradesh.*
Results*: 48 patients diagnosed with acute pancreatitis were studied.17(36%) of them were aged between 31-40 years.There was male prepondrance in this study accounting for 43(89%).Out of the 48 patients, 20(41.6%) had mild, 14(29.2%) moderateand 14(29.2%) patients had severe acute pancreatitis. In present study, NLR on day 0 , 1 & 2 are correlating well with severity of acute pancreatitis and is statistically significant (P <0.001)*
Conclusion:*Neutrophil Lymphocyte ratio has proved to be an indicator in assessing the severity of acute pancreatitis. Continuous monitoring of NLR on each day will provide a dynamic response of the body to pancreatitis and hence predict the severity and prognosis earlier.*
Key Word*: NLR-Neutrophil Lymphocyte Ratio,Acute Pancreatitis*

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I. Introduction

Acute pancreatitis is the most common inpatient principal gastrointestinal diagnosis[(1)]. It is usually a self-limiting process; however, 25 % of patients present with or subsequently develop a severe form of the disease that is associated with a mortality of up to 50%[(2)].Accurate predictors of the severity of acute pancreatitis are important because they influence clinical decision making. Severity of acute pancreatitis can be assessed by many standardized scoring systems like Ransons scoring system, APACHE-II scoring systems,Glasgow imrie criteria & most of them were not suitable for stratifying severity at the time of admission[(3)].But NLR score is one parameter which would be cheap, easy to perform even in hospitals with limited facilities & peripherally located hospitals. Neutrophil–lymphocyte ratio (NLR), calculated from theratio of the absolute neutrophil Count to the absolute lymphocyte count &provides information regarding the extent of an inflammatory process.

II. Material And Methods

Study Design: Hospital based observational study
Study Location: This was a tertiary care teaching hospital based study done in Department of General Medicine, at Maharajahs institute of medical sciences, Vizianagaram , Andhra Pradesh,India.
Study Duration: July 2022 to December 2022.
Sample size: 48 patients.
Sample size calculation: Sample size was estimated using the formula$n$=[$(Z\alpha)^2\times$ $(SD)^2$]/ d^2
n=SampleSize, At α = 5 % ; $Z\alpha$ = 1.96 ; SD=averagestandarddeviationofthecharacter= 1.7
d = 5% of the mean = (5/100) x 9.6 = 0.48 ; n = $(1.96)^2$ x $(1.7)^2$ / $(0.48)^2$ = 48 ; Sample size = n = 48

Subjects & selection method: The study population consists of Acute pancreatitis patients diagnosed based on the following criteria with atleast two of the following three criteria[(1)]-

1) Abdominal pain consistent with the disease

2) Threefold increase in serum amylase or lipase level
3) Imaging findings (CT or USG Abdomen) consistent with acute pancreatitis.

These patients are subjected to Blood investigations with Blood samplescollected on day 0 after hospitalization,day1 and day2 for neutrophil lymphocyte ratio & reports are recorded.

Inclusion criteria:

1. Patients with features of acute pancreatitis
2. Either sex
3. Aged ≥ 18 years

Exclusion criteria:

1. Aged < 18 years.
2. Patients with chronic pancreatitis.
3. Patients with concomitant malignancy.
4. Patients with autoimmune pancreatitis.
5. Patients with liver cirrhosis.
6. Patients currently on steroids.
7. Patients with Covid 19.
8. Patients with COPD.
9. Patients not willing to participate in the study.

Procedure methodology:

As per the inclusion and exclusion 48 patients are included in the study population. Informed consent was obtained from all the patients of study population. Acute pancreatitis was diagnosed based on the clinical,radiological and laboratory parameters.

Blood samples were collected on day 0 after hospitalization,day1 and day2 for neutrophil lymphocyte ratio & reports are recorded. The NLR(Neutrophil-Lymphocyte ratio) is defined as the ratio of the absolute neutrophil Count to the absolute lymphocyte count measured. Assessment of severity of acute pancreatitis was done according to Revised Atlanta Classification 2012(4) & then compared with NLR at day 0, day 1 and day 2.

Disease severity	Symptoms
Mild acute pancreatitis	No local or systemic complications
Moderately severe acute pancreatitis	Organ failure that resolves within 48hr (transient organ failure) Local or systemic complications without persistant organ failure
Severe acute pancreatitis	Persistent organ failure (>48hr) Single organ failure Multiple organ failure

Statistical analysis:

Statistical analysis was performed using SPSS 28.0 (IBM).Categorical variables were presented as counts and percentages , while continuous variables were analyzed using means and standard deviations and interpreted by ANOVA (Analysis Of Variance) since there were more than two groups.The level $P < 0.05$ was considered as the cutoff value or significance.

III. Result

The mean age group for mild, moderate and severe pancreatitis were 34.8±9.4 years, 36.3±13.3 years and 38.6±13.7 years respectively.Out of the 48 patients, 20(41.6%) had mild pancreatitis, 14(29.2%) moderate pancreatitis and 14(29.2%) patients had severe acute pancreatitis.There were males predominant in this study, out of 48 patients, 43 were males and 5 were females.

Table 1: Age and Gender Distribution among study Patient

Variable	Category	N	%
Age(years)	18-30 years	9	19%
	31-40 years	17	36%
	41-50 years	12	25%
	51-60 years	7	14%

	>60 years	3	6%
Gender	Male	43	89%
	Female	05	11%

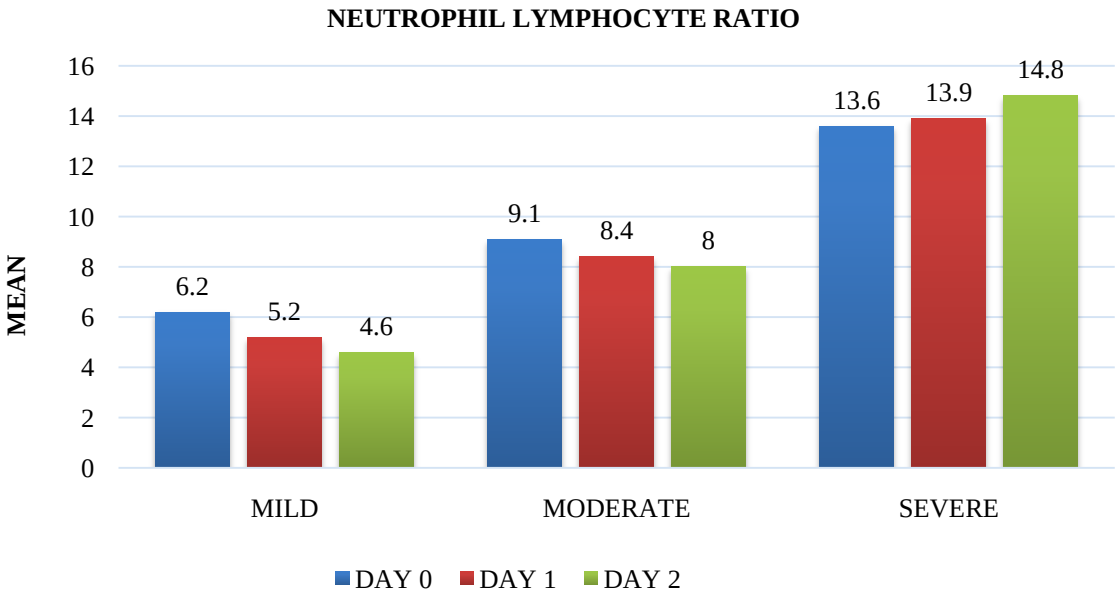
Table 2: Acute Pancreatitis Severity Distribution among study Patient

Variable	Severity	N	%
Acute Pancreatitis	Mild	20	41.6%
	Moderate	14	29.2%
	Severe	14	29.2%
	Total	48	100%

Table 3: Mean Neutrophil Lymphocyte ratio on Day 0, Day 1, Day 2

SEVERITY BASED ON ATLANTA CLASSIFICATION	NLR – 0		NLR – 1		NLR – 2	
	MEAN	SD	MEAN	SD	MEAN	SD
MILD	6.2	1.2	5.2	1.1	4.6	0.8
MODERATE	9.1	1.6	8.4	1.7	8.0	1.4
SEVERE	13.6	2.5	13.9	1.4	14.8	1.6
SIGNIFICANCE	P<0.001		P<0.001		P<0.001	

The mean NLR at day 0 of Mild group was 6.2±1.2 , moderate group was 9.1± 1.6 and severe group was 13.6±2.5. The differences between the severity was statistically significant (P <0.001).The mean NLR at day1 of Mild group was 5.2±1.1 and the moderate group was 8.4± 1.7 and severe group was 13.9±1.4. The differences between the severity was statistically significant (P<0.001).The mean NLR at day2 of mild group was 4.6± 0.8, moderate group was 8.0± 1.4 and severe group was 14.8±1.6. The differences between the severity was statistically very highly significant (P <0.001).



IV. Discussion

In the present study,48 patients diagnosed with acute pancreatitis were studied and most common age group is 31-40years in 17patients (36%) which is similar to the study done by Kumar P et al[(2)].

The mean age group for mild, moderate and severe pancreatitis were 34.8±9.4 years, 36.3±13.3 years and 38.6±13.7 years respectively in the present study which is similar to several other studies[(9,10)]. In the study done by Hussain et al[(11)] mean age result was not similar to the present study.

There was male prepondrance in this study accounting for 43(89%) which is concordant with the studies done by Bhanou NMS et al[9],Kumar P et al[2]and is different with the studies done by Halaseh et al[6]where female prepondrance is seen.

In the present study, Out of the 48 patients, 20(41.6%) had mild pancreatitis, 14(29.2%) moderate pancreatitis and 14(29.2%) patients had severe acute pancreatitis. Where as in the study done on 107 patientsby Bhanou NMS et al[9] they categorised pancreatitis as mild(47.7%),moderate(22.4%), severe(29.9%) which is similar to the present study. In the studies done by Kumar P et al[2] , Han C et al[10] they categorised pancreatitis as mild and severe acute pancreatitis accounting for (62%,38%) and (52%,48%) respectively which is different from present study.

In the present study, NLR on day 0 , 1 & 2 are correlating well with severity of acute pancreatitis and is statistically significant (P <0.001).The benefit of present study is that NLR can be calculated by just doing a total WBC and a differential count. In comparison to other severity scoring systems, where there are multiple parameters required to calculate the prognosis, NLR analysis just needs a single blood test which has to be done serially. NLR assessment trespasses the limitation of Ranson's scoring system that, it can be used at the time of admission itself and monitoring is possible in the first 48 hours. It covers the limitation of APACHE II scoring system in a way that it avoids multiple parameters needed for assessment.

In present study ,the neutrophil to lymphocyte ratio tend to remain high in severe pancreatitis group compared to mild group.In present study ,the NLR in mild group& moderately severe group is high at the time of admission and tends to decrease towards normalcy on the subsequent days. The NLR in severe group is very high compared to mild group and tends to remain at a higher level compared to mild pancreatitis group.

A retrospective study by Gayathri B et al[5] found that the neutrophil to lymphocyte ratio is significantly higher in severe group compared to mild and moderate group which is similar to the present study.

A retrospective study on 314 patients done by Halaseh SA et al[6] found that the neutrophil to lymphocyte ratio is significantly higher in severe group compared to mild group which is similar to the present study.

A study done by Kokulu K et al[7] where 100 patients were studied & their results showed a significant correlation on day 0 (at the time of admission) and on day 2(at 48hrs) but not on day 1 which is different from the present study with respect to day 1 of NLR.

Continuous monitoring with NLR on each day will provide a dynamic reflection of the immunity and inflammatory response of the body to pancreatitis.Those patients progressing to severe pancreatitis can be identified earlier and can be managed intensively and hence reduce the mortality and morbidity. NLR can be easily calculated and is a routine workup investigation that is done in all patients at the time of admission. It is a less cumbersome, cost effective screening method.

V. Conclusion

Neutrophil Lymphocyte Ratio has proved to be an indicator in assessing the severity of acute pancreatitis.Continuous monitoring of NLR on each day will provide a dynamic response of the body to pancreatitis and hence predict the severity and prognosis earlier.

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