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RESEARCH ARTICLE

NEUTROPHIL/LYMPHOCYTE RATIO AS A PREDICTOR OF SEVERITY IN ACUTE APPENDICITIS

^{1,*}Ofir Rodríguez- Aguilera, ²Hugo Enrique Reyes- Devesa, ³Reyes Javier Cervantes- Ortiz, ⁴Verónica Torres- Medina, ⁵Amparo Saucedo- Amezcua and ⁶Francisco Javier Barrios- Pineda

¹⁴th year Surgical Resident, High Specialty Hospital of Veracruz, Veracruz, México

²Hospital Director, High Specialty Hospital of Veracruz, Veracruz, México

³Anesthesiologist, High Specialty Hospital of Veracruz, Veracruz, México

⁴Head of Education Department, High Specialty Hospital of Veracruz, Veracruz, México

⁵ Education Department, High Specialty Hospital of Veracruz, Veracruz, México

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ABSTRACT

Objective: To determine the neutrophil/lymphocyte ratio as a predictor of severity in acute appendicitis. **Methodology:** An observational, cross-sectional, retrospective, and descriptive study was conducted on patients admitted for acute appendicitis to determine the predictive value of severity using the neutrophil-lymphocyte index (ratio of total neutrophils to total lymphocytes) with a cut-off point of 3. Other observed variables included sex, age, comorbidities, and surgical findings. The data were analyzed using descriptive statistics, diagnostic tests with a 95% confidence interval, and the SPSSv26.0 statistical package. **Results:** Sixty patients with a diagnosis of acute appendicitis were included, with an average age of 34.4 ± 14.2 years, 35 (58%) female, and an evolution of symptoms for 2.4 ± 2.1 days. Four (6.7%) had hypertension. No complications were observed in 30 cases (50%), while abscess and perforation occurred in 9 (15%). The predictive value of the neutrophil/lymphocyte index for the presence of severe complications showed a sensitivity of 100% (95% CI 84.5-100) and a negative predictive value of 100% (95% CI 67.6-100). **Conclusion:** The neutrophil/lymphocyte index has a sensitivity and negative predictive value of 100% for complicated acute appendicitis.

INTRODUCTION

Acute appendicitis is the most common indication for abdominal surgery, occurring most frequently between the second and third decades of life and can have serious repercussions on the patient's health. The lifetime risk of acute appendicitis is 8.6% for men and 6.7% for women, with a rate of 1.5 to 1.9 cases per 1000 inhabitants. The obstruction of the appendiceal lumen, secondary to fecaliths, lymphoid hyperplasia, foreign bodies, parasites, and primary tumors, is the origin of acute appendicitis. Abdominal pain is the central symptom of acute appendicitis, initially diffuse in the lower epigastrium or umbilical area, moderately intense and constant, with intermittent colicky episodes, sometimes presenting as atypical or masked conditions, especially in children and the elderly. Vomiting, which is neither notable nor prolonged, may occur, along with fever, anorexia, and localized pain at McBurney's point. Acute appendicitis is a pathology with predominantly clinical diagnosis.

Leukocytosis is highly predictable in patients with acute appendicitis, and a leukocyte count equal to or greater than 17,000 cells/mm³ is associated with complications of acute appendicitis. The distinction between complicated and uncomplicated appendicitis and between regional and diffuse peritonitis is crucial for the management of appendicitis. The neutrophil/lymphocyte ratio (NLR) calculation can be significantly higher in patients with complicated appendicitis compared to those with simple appendicitis, with a sensitivity of 96%. Therefore, the purpose of this study is to identify whether the neutrophil/lymphocyte index is a predictor of complications in acute appendicitis.

MATERIALS AND METHODS

Through an observational, cross-sectional, prospective, and analytical design, the study was conducted on patients who presented to the emergency department with acute appendicitis, including patients over 18 years old, with identification of complete blood count at admission. Patients with a history of hemolytic diseases, blood dyscrasias, and pregnancy were excluded. Sample size was calculated using a formula for descriptive studies without knowing the universe. Once the patient who presented to the emergency department with suspected acute appendicitis was located, they were asked

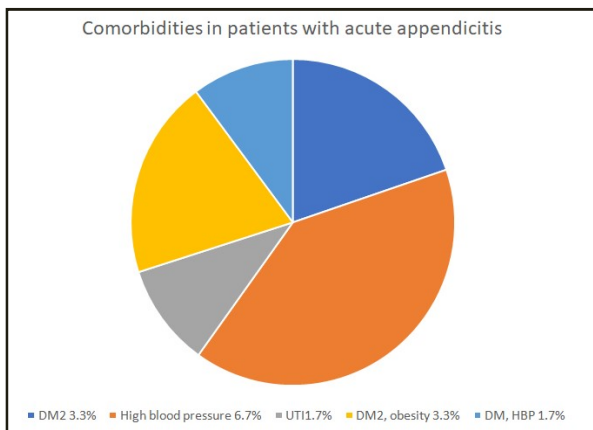
*Corresponding author: Ofir Rodríguez- Aguilera,

⁴th year Surgical Resident, High Specialty Hospital of Veracruz, Veracruz, México.

if they wished to participate in the study, and once accepted, informed consent was obtained. The study began when a blood sample was taken in the preoperative period to measure leukocytes and neutrophils. Age, sex, duration of symptoms, comorbidities, and surgical findings were recorded after the surgical event. The neutrophil/lymphocyte index was defined as the absolute count of neutrophils divided by the absolute count of lymphocytes, obtained as $NLR = \text{Neutrophils/Lymphocytes}$, and compared with the intraoperative findings recorded in the medical records of the patients included in the study. The data obtained were entered into an Excel table for descriptive analysis using measures of central tendency: mean, median, mode, diagnostic tests with 95% CI, supported by the SPSSv26.0 statistical package.

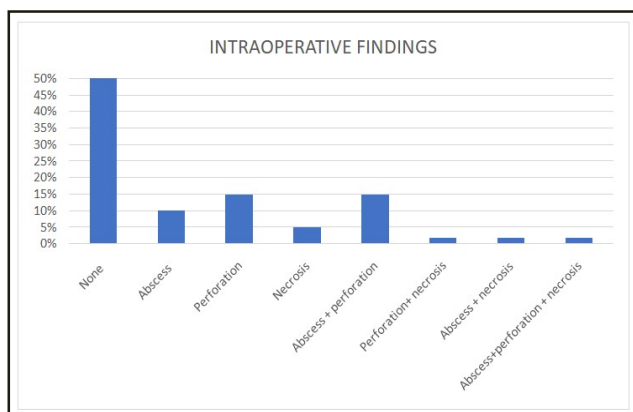
RESULTS

Sixty patients were selected with a diagnosis of acute appendicitis, with an average age of 34.4 ± 14.2 years, 35 (58%) female, and an average duration of symptoms of 2.4 ± 2.1 days. Comorbidities included hypertension in 4 (6.7%) and type 2 diabetes mellitus in 2 (3.3%). As shown in Figure 1, no data on complicated acute appendicitis were observed in 30 cases (50%). Abscess and perforation were found in 9 cases (15%), as seen in Figure 2. The predictive value of the neutrophil/lymphocyte index for the presence of complications in acute appendicitis showed a sensitivity of 100% (95% CI 84.5-100) and a negative predictive value of 100% (95% CI 67.6-100), as observed in Table 1.



Source: HAEV

Figure 1. Comorbidities in patients with acute appendicitis



Source: HAEV

Figure 2. Intraoperative findings in acute appendicitis

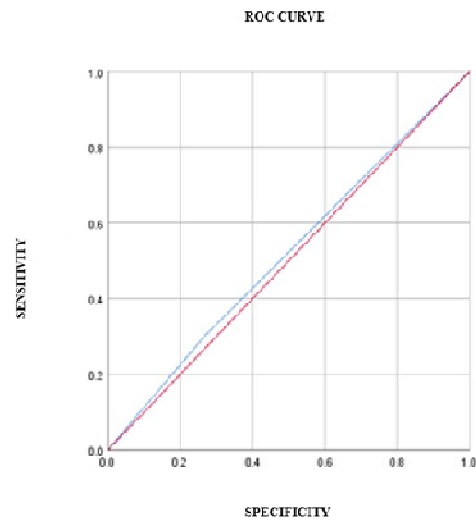


Figure 3. Area under ROC curve of NLR to detect severity in acute appendicitis

AREA UNDER THE CURVE				
Test Outcome Variables: NLR				
Area	Error Desv ^a	Asymptotic Significance ^b	95% Asymptotic Confidence Interval	
			Lower Limit	Upper Limit
.517	.075	.824	.369	.664

The NLR test outcome variables have at least one tie between the true positive state group and the true negative state group. The statistics may be biased
 a. Under the non- parametric assumption
 b. Null Hypothesis: true area= 0.5

Table 1. Predictive value of the neutrophil/lymphocyte ratio as a predictor of severity in acute appendicitis

Diagnostic Test	Result	IC 95%
Sensitivity	100%	84.5-100
Specificity	27%	14.2-44.4
Positive Predictive Value	49%	34.6-63.2
Negative Predictive Value	100%	67.6-100
% False Positives	73%	55.6-85.8
% False Negatives	0%	0-15.5

Source: HAEV

DISCUSSION

In this study, 60 patients with acute appendicitis treated in the emergency department of our hospital were included. The average age was 34.4 years, with a predominance of females at 58%, similar to the study by Guevara Castro *et al.*, where 207 patients with acute appendicitis were included, with a predominance of females at 54%. The most common comorbidity in this group was hypertension in 2% of patients and diabetes mellitus in 1%, contrasting with the frequency of males in the study by QuizhpiGuamán *et al.*, where acute appendicitis was more frequent in males at 58%, with an average age of 25 years. In our cohort, the most common comorbidity was hypertension in 7% and type 2 diabetes mellitus in 3.3%, obtaining similar values to the study by Guevara Castro. In our study, the average time between the onset of symptoms and surgical intervention was 2 days. Of the total cases analyzed, 50% had intraoperative findings consistent with complicated acute appendicitis, with perforation and abscess being the most frequent complications. The predictive value of the neutrophil/lymphocyte index for the presence of complicated acute appendicitis showed a sensitivity of 100% (95% CI 84.5-100) and a negative predictive value of 100% (95% CI 67.6-100). It is important to recognize variations in this test, as some studies use a cut-off point higher than ours. The study by Ahmed S. *et al.* used a cut-off point of 6.1, which demonstrated diagnostic capability

for complicated acute appendicitis with sensitivity, specificity, positive predictive value, and negative predictive value of 69.8%, 53%, 81.5%, and 38%, respectively, with values lower than our study. Another study with a higher cut-off point of 6, by Seclén-Hidalgo *et al.*, obtained operative characteristics of sensitivity, specificity, diagnostic accuracy, positive and negative predictive values of 78.1%, 84.3%, 82.0%, 80.8%, respectively.

CONCLUSION

The neutrophil/lymphocyte index as a predictor of severity in acute appendicitis using a cut-off point of 3 demonstrated good predictive capacity, with results similar to the studies consulted.

Conflict of Interest: **None**

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