

# The Role of the Value of the Sensitivity and Specificity of Leukocytes, Neutrophils in the Diagnosis of Acute Appendicitis of Children in Haji Adam Malik General Hospital Medan

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## ABSTRACT

Acute appendicitis in children is one of the causes of the emergency abdomen that requires immediate surgery. (Victor, et al., 2012; Ballester et al., 2009; Huckins et al., 2013). The incidence of acute appendicitis in children in the world ranges from 1-8% of all pediatric patients who come to the Emergency Department (IGD) with complaints of acute abdominal pain (Jangra et al., 2013). In 2006 acute appendicitis was ranked 4th in Indonesia, after dyspepsia, duodenitis, and other gastrointestinal diseases with the number of hospitalized patients reaching 28,949 (Eylin, 2009).

During this acute inflammation of the appendix is established based on history taking, physical examination, laboratory examination, or complete blood. There are two markers of the results of complete blood laboratories which are often used for cases of appendicitis in the first 24 hours after the onset of pain, namely leukocytes and neutrophils. On a complete blood count found leukocytes between 10,000-15,000 / mm<sup>3</sup> (leukocytosis), although leukocytes count is commonly used in children with suspected acute appendicitis, this is not specific and not sensitive to this disease. Although several studies show an association between increased levels of leukocytes with a diagnosis of appendicitis, the results vary greatly (Al-gaithy, 2002).

The study will be carried out in the Division of Pediatric Surgery in RSUP H. Adam Malik Medan to determine the role of the sensitivity and specificity of leukocytes and neutrophils in the diagnosis of acute appendicitis in children. This research is an observational analytic study with a cross-sectional design. Sampling was done by consecutive sampling. There were 54 research samples whose mean age was 10.02 ± 3.17 years. The data collected is presented descriptively in the frequency distribution table.

**Keywords:** acute appendicitis, leukocytes, children

## INTRODUCTION

In Physiology Appendix is a lymphoid organ such as tonsils, Peyer patches (analogous to the Fabricius Exchange) to form immunoglobulin products. The appendix is a small structure, shaped like a tube that connects attached to the initial part of the cecum. The appendix produces 1-2 ml of mucus per day. The mucus is normally poured into the lumen and then flows to the cecum.

Histologically, the appendix has the same structural basis as the large intestine. The mucosal gland is separated

from vascular submucosa by the mucosa masculine. The outside of the submucosa is the main muscle wall. The appendix is covered by serous tunica which consists of vascularization of large blood vessels and joined together in the mesoappendix. If the appendix is located retroperitoneal, the appendix is not covered by serous tunica.

Anatomically the vermiform appendix is an intestinal diverticulum that is approximately 6-10 cm in size and is located in the caecum. This organ is tubular with a narrow lumen in the proximal part and widening in the distal part, the capacity of the appendix itself is approximately 0.1 ml. This

organ is composed of lymphoid tissue and is an integral part of GALT (Gut Associated Lymphoid Tissue). The most appendix locations are from the posteromedial caecum, below the ileocaecal junction. The appendix itself has a mesentery that surrounds it, called the mesoappendix which originates from the posterior part of the mesentery which surrounds the terminal ileum. The most position of the appendix is retrocaecal, however, there are variations from the location of this appendix. 65% of the appendix position is intraperitoneal while the rest is retroperitoneal. Here the variation in the position of the appendix determines the symptoms that will appear when inflammation occurs (Aschraff, 2000). The most position is retrocaecal, however, the position of the appendix can be found by tracing the three taeniae found in the caecum, namely taenia colica, taenia libra, and taenia omentalis.

Appendicitis is inflammation that occurs in the appendix vermiformis and is the most common cause of acute abdomen. Until now it has not been known exactly what the function of the appendix is actually. Appendicitis can be caused due to infection or obstruction in the appendix. The obstruction causes the appendix to swell, changes in normal flora and is easily infected by bacteria. If the diagnosis is made slowly, perforation can occur in the appendix. So that the result is Peritonitis or abscess formation around the appendix (Schwartz, 2009).

Acute appendicitis can be caused by an inflammatory bacterial process that is triggered by several precipitating factors including lymphatic tissue hyperplasia, fecaliths, appendix tumors, and clogged ascetic worms. Mucosal ulceration is the initial stage of most of these diseases (Sabiston, 2008)

The appendix produces 1-2 ml of mucus per day. The mucus is normally poured into the lumen and then flows into saikum. Barriers to mucus flow in the appendix estuary appear to play a role in the pathogenesis of appendicitis. Appendicitis is usually caused by obstruction of the appendix lumen by lymphoid hyperplasia of the lymphoid, fecalith, foreign body, stricture due to fibrosis due to previous inflammation, or neoplasm. At the beginning of appendicitis, the patient may not have fever or subgenres. Higher temperature increases are associated with perforated appendicitis (Lee, 2013). Classic symptoms are only found in 55% of cases if the appendix is anterior. (Lee, 2013) Symptoms begin with abdominal pain in the periumbilicus that weighs in 24 hours.

Atypical symptoms are associated with variations in the location of the anatomy of the appendix (Lee, 2013). Blunt pain often appears when the tip of the appendix is located retrosecally. Findings of physical examination in children can vary depending on the age of the child. Irritability can be the only sign of appendicitis in neonates. Older children often appear uncomfortable or alone, preferring to lie still due to irritation of the peritoneum. Teenagers often have a classic

sign of appendicitis (Minkes, 2013). Most children with appendicitis are not feverish or subfebrile (Minkes, 2013). On general physical examination usually found a temperature of 38 oC or lower, fluctuating temperatures may indicate an appendix abscess (DynaMed, 2013).

Leukocyte counts increase in 70-90% of cases of acute appendicitis. However, the increase is usually mild and only clearly visible after more than 24 hours of the disease course or after the disease process continues. An increase in neutrophils was also found to be more than 75% in 78% of patients with acute appendicitis (Craig, 2013).

Histopathology examination is the gold standard of diagnosis of appendicitis. In the early stages of appendicitis, the appendix appears macroscopically with dilated serous blood vessels. At an advanced stage of appendicitis, macroscopically there are signs of mucosal necrosis to the outer layer of the appendix wall and gangrene can be found. Normal appendix findings at the time of surgery require careful histopathological examination. Occasionally, grade 1 (early appendicitis) appendicitis is only identified on histology and is clinically correlated with resolution of symptoms before surgery.

Appendices that have been inflamed will not heal completely but will form scar tissue that causes adhesions to the surrounding tissue. This adhesiveness can cause repeated complaints in the lower right abdomen. At one time this organ can become inflamed more acute and declared to have an acute exacerbation (Santacrose, 2006).

In the study of Hani Noh (2012) all patients were classified in the simple appendicitis group and the complicated appendicitis group based on postoperative histopathology. Complicated appendicitis is defined as gangrenous appendicitis and / or perforation. This difference is not clear and only clinically relevant differences from simple appendicitis and complicated appendicitis will be used.

## METHOD

The study was conducted from April to November 2018. The research will be conducted at the Children's Surgery Division of H. Adam Malik General Hospital Medan to determine the role of the sensitivity and specificity of leukocytes and neutrophils in the diagnosis of acute appendicitis in children. This research is an observational analytic study with a cross-sectional design. Sampling was done by consecutive sampling. There were 54 research samples whose mean age was  $10.02 \pm 3.17$  years. The data collected is presented descriptively in the frequency distribution table. Data between the laboratory components of neutrophils and leukocytes is numerical data, so the hypothesis test is analyzed with an unpaired t-test. Followed by the Receiver Operating Characteristic (ROC) analysis of each

predictor to determine the sensitivity and specificity of the appendicitis outcome variable.

## RESULTS AND DISCUSSION

In this study, 54 research samples were analyzed by data. Of the 54 patients, the mean age was  $10.02 \pm 3.17$  years, consisting of 31 (57.4%) males and 23 (42.6%) female patients. From the data, it was also obtained that from 54 study samples, there were 27 patients (50.0%) patients included in acute appendicitis and 27 (50.0%) patients included in complicated appendicitis. The ratio between the sexes of men versus women was also obtained from other studies, which stated that the ratio of men is higher than women with a ratio of 3: 2 (Schwartz, 2009). Demographic data of patient characteristics sampled are listed in Table 4.1.

In this study, the comparison between acute appendicitis and complicated groups of leukocyte and neutrophil values. From table 4.2, it was found that the values of leukocytes in acute appendicitis and complicated appendicitis sequences were 14,377.41 ( $\pm 7,014.99$ ) and 18,130.37 ( $\pm 5,648.33$ ) with p values of 0.035. While the neutrophil value in the acute and complicated appendicitis group was 74.80 ( $\pm 14.77$ ) and 82.38 ( $\pm 7.03$ ) with a p-value of 0.021.

Based on the analysis using the Receiver Operating Characteristic (ROC) curve, the leukocyte variable has an area under the curve (AUC) of 66.7% compared to neutrophils which have an AUC of 63.6%. With a cut-off value of 77.90%, neutrophils have a sensitivity of 81.50% and a specificity of 48.15%. Whereas the leukocyte value, with a limit value of  $> 12,000 / \text{mm}^3$  will give a sensitivity value of 92.60% with a specificity value of 44.44%.

Our results are quite by the results stated by Xharra in 2012 from his research stating that neutrophil sensitivity and specificity are 79.1% and 68%, whereas leukocyte sensitivity and specificity are 85.1% and 68%, thus concluded by Xharra that leukocytes are slightly better predictors of appendicitis than neutrophils (Xharra, 2012).

## CONCLUSION

From the research we have done, it can be concluded that there is no difference in the role of sensitivity and specificity values of leukocytes and neutrophils in the diagnosis of acute appendicitis in children.

## SUGGESTION FOR FUTURE RESEARCH

Further research should be developed to assess the role of other predictors in diagnosing appendicitis, especially

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in children. So that later in making a diagnosis of appendicitis, especially in children will be easier.

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