

Characteristics of Appendicitis Patients in PKU Muhammadiyah Bantul Hospital: A Cross Sectional Study

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Abstract. Appendicitis is an inflammation of the vermiform appendix. In 2019, worldwide there were estimated to be more than seventeen million cases of acute appendicitis. The difference in lifetime risk and incidence of appendicitis from various studies around the world raises a new possibility that there are differences in the characteristics of appendicitis in each population. This study aims to determine the main characteristics of appendicitis patients. This is an analytic-research with a cross sectional approach using total sampling technique with a total of 211 patients at PKU Muhammadiyah Bantul Hospital 2022. Appendicitis patients were predominantly female; in the age range of 20- 44 years; the most common type was uncomplicated appendicitis; the average length of stay was 5 days; the average leukocyte was 10,616/ μ L; the average thrombocytes count was 323,825/ μ L; and the most common complaint was abdominal pain. The characteristics of appendicitis patients are different in each population. Doctors are required to understand the disease and conduct a comprehensive examination so that patients can be treated properly.

1. Introduction

Appendicitis is an inflammation of the vermiform appendix. The cause of acute appendicitis is still unknown. However, based on recent findings, acute appendicitis is thought to originate from an obstruction of the appendiceal cavity. This blockage then increases luminal tension and facilitates the process of necrosis and perforation [1]. In 2019, there were estimated to be more than seventeen million cases of acute appendicitis worldwide. This incidence rate has risen sharply since 1990. Despite the increasing incidence, the mortality rate of acute appendicitis has been decreasing over the years as medical science develops. Appendicitis occurs mostly at a young age with a peak in the age range of ten to twenty years [2]. In the

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United States, the lifetime risk of experiencing acute appendicitis is 8.6% in men and 6.7% in women [3]. This figure is higher when compared to the lifetime risk in Europe which is around 8% and Africa which is only 2% [4]. In South Korea, the lifetime risk of someone experiencing acute appendicitis is around 16.33% in men and 16.34% in women [5]. The difference in lifetime risk from various studies around the world raises a new possibility that there are differences in the characteristics of appendicitis in each population. Differences in characteristics may be due to differences in diet in these countries. In addition, differences in terms of sociodemographics, race, religion, and different health facilities can also produce different characteristics [5].

As one of the referral health care facilities in Bantul regency, PKU Muhammadiyah Bantul Hospital has treated a variety of appendicitis patients. To improve services, treatment, and prevention efforts, it's essential to discuss the differences in patient characteristics. This study aims to determine the main characteristics of patients' appendicitis to get a clearer and more detailed picture. This research aligns with one of the 17 sustainable development goal (SDG) for 2030, declared by both developed and developing countries at the UN General Assembly in September 2015 point 3, which focuses on ensuring healthy lives and promoting well-being for all at all ages.

2. Material and Methods

The study was conducted at PKU Muhammadiyah Bantul Hospital from January to March 2024. This study is an analytical study with a cross sectional approach using secondary data from patient medical records. All patients with the diagnosis of appendicitis at PKU Muhammadiyah Bantul Hospital during 2022 were eligible, and patients with incomplete medical records were excluded. Sampling in this study used a total sampling technique of 211 people. Data analysis uses univariate analysis for characteristic respondents and uses bivariate analysis to look for correlations between respondent characteristic variables using SPSS 27. Statistical significance was declared when the p-value was less than 0.05 at 95% CI. The variables in this study were gender, age, type of appendicitis, length of hospitalization, leukocyte count, platelet count, and main symptom.

3. Results and Discussion

This study was conducted in January-March 2024 by taking secondary data from the medical records of Appendicitis patients at PKU Muhammadiyah Bantul Hospital in 2022. The total population was 211 patients. Based on the results of the study, as presented in table 1, there were 120 female patients (56.9%) and 91 male patients (43.1%). It was found that the age group 20-44 was the age group with the highest incidence of appendicitis, namely 78 people (37.0%). The number of patients with uncomplicated appendicitis is more than complicated appendicitis. There were 183 patients with uncomplicated appendicitis (86.7%) while there were 28 patients with complicated appendicitis (13.3%). A total of 101 people (47.9%) had a length of hospitalization of ≤ 4 days and the remaining 110 people were admitted for > 4 days. 139 people (65.9%) did not experience an increase in leukocyte count. An increase in leukocyte count occurred in 72 people (34.1%). 187 people (88.6%) did not experience an increase in thrombocytes count. An increase in thrombocytes count only occurred in 24 people (11.4%). 182 patients (86.3%) came to the hospital with complaints of abdominal pain, 13 patients (6.2%) with fever, 11 patients (5.2%) with nausea and vomiting, and the least common complaints were gastrointestinal disorders (diarrhoea, constipation, unable to flatus, etc.) with 5 patients (2.4%).

Table 1. Baseline Characteristics of the Study Population.

Variable	Frequency (n)	Percentage (%)	Mean	SD
Gender				
Male	91	43.1	33	18.43
Female	120	56.9		
Age (years)				
0-1	0	0		
2-5	2	0.9		
6-12	30	14.2		
13-19	36	17.1	-	-
20-24	78	37.0		
45-64	55	26.1		
>65	10	4.7		
Appendicitis Type				
Uncomplicated	183	86.7	-	-
Complicated	28	13.3		
Length of Stay				
≤4 days	101	47.9	4.9	1.566
>4 days	110	52.1		
Leukocytes Count				
≤11.000	139	65.9	10.62	4.987
>11.000	72	34.1		
Thrombocytes Count				
≤450.000	187	88.6	323.820	104.640
>450.000	24	11.4		
Main Symptom				
RLQ Pain	182	86.3		
Fever	13	6.2	-	-
Nausea and Vomiting	11	5.2		
Constipation	5	2.4		

We then calculated the correlation between age and appendicitis type. Statistical analysis using the Mann-Whitney Test gave a $p>0.05$ value ($p=0.148$). These results indicate that there is no statistically significant difference between the types of appendicitis based on a person's age. Based on chart 1, it is known that the type of uncomplicated appendicitis is mostly experienced by patients aged 20-44 years (68 people). This result is in line with the statement from Bhangu et al [6] which states that the incidence of appendicitis often occurs at the age of 20-30 years. This is often associated with the rapid development of lymphoid tissue in adulthood, making it easier for obstruction to occur and cause appendicitis. In addition, Windy and Sabir [7] explain that in adulthood appendicitis is also triggered by hereditary diseases, sedentary lifestyles, and low-fibre fast food that causes constipation and triggers blockade in the appendix.

Table 2. Correlation of Age with Appendicitis Type.

Appendicitis Type	Median of Age (Max-Min)	P value
uncomplicated	31 (79-3)	0.148
complicated	37.5 (70-9)	

Correlation testing of length of stay with age was carried out with each variable into numeric data. In the normality test, it was found that the distribution of the data is not normal, then the correlation test is continued with the correlation test Spearman. From this test, a p value <0.05 is obtained so it can be considered Statistically there is a significant correlation.

Table 3. Correlation of Length of Stay with Age.

	Age
Length of Stay	r = 0.146 p = 0.035 n = 211

From the Spearman correlation test, a p value of <0.05 was obtained, it can be concluded that statistically there is a significant correlation between age and length of hospitalization. This result is in accordance with the research of Maharani et al [8] that increasing age has a relationship with the length of a person's hospitalization. According to Potter [9], the age factor is one of several intrinsic factors that influence the length of hospitalization of a patient. The appendix has a role in the immune system where there is GALT (Gut Associated Lymphoid Tissue) and Peyer's patch to produce immunoglobulin A which in old age is atrophied [10]. The age factor is also related to exposure to free radicals (ROS), sclerosis and fibrosis of blood vessels, and adipose infiltrates in the muscular layer so that the older the age, the body requires a longer recovery time [11]. The majority of non-complicated appendicitis patients had a shorter length of hospitalization while more patients with complicated appendicitis underwent >4 days of treatment. This is supported by the Mann-Whitney test which gives a p value <0.05 (p=<0.001). These results indicate that there is a significant difference in the length of hospitalization of patients based on the type of appendicitis.

Table 3. Correlation of Appendicitis Type with Length of Stay.

Appendicitis Type	Length of Stay (Min-Max)	P value
uncomplicated	4 (3-14)	<0.001
complicated	6 (3-9)	

The findings in this study are in line with the research of Kurniadi et al [12] which states that there is indeed a significant relationship between the type of appendicitis and the length of hospitalization of patients. Patients with uncomplicated type were on average treated for less than 5 days while patients with complicated appendicitis had a longer length of stay of 5 days. the difference in length of hospitalization in complicated and uncomplicated patients is related to the severity of the patient. In acute appendicitis patients, the healing process usually does not require a long time so that the length of hospitalization is not too long ranging from 1-4 days [13]. Correlation testing of length of stay with leukocytes count was carried out with each variable into numeric data. In the normality test, it was found that the distribution of the data is not normal, then the correlation test is continued with the correlation test Spearman. From this test, a p value <0.05 is obtained so it can be considered Statistically there is a significant correlation. Correlation value 0.227 shows a positive correlation with a weak correlation level.

Table 4. Correlation of Length of Stay with Age.

	Leukocytes Count
Length of Stay	$r = 0.227$ $p = <0.001$ $n = 211$

From the Spearman correlation test, the p value <0.05 was obtained so that it can be considered that there is a significant relationship and the direction of the correlation is positive with a weak correlation. These results are in line with research from Yusuf, Kulsum and Gianty [14]. In the study, patients with leukopenia and normal leukocyte counts had a shorter hospitalization period than appendicitis patients with leukocytosis. Leukocytes increase when there is an infection in the body, increasing leukocyte numbers can be associated with increasing severity of a person's infection. Complicated appendicitis patients generally have a higher leukocyte count as a body defence system against pathogens [15]. The study from Kwon, Lew and Chamberlain [16] states that leukocyte transfusion is proven to improve postoperative outcomes and reduce the incidence of surgical site infections, the incidence of complications, length of treatment, and mortality in patients. The statistical analysis test used to assess the relationship between appendicitis type and leukocyte count was the Mann-Whitney test. This test showed $p <0.05$ ($p=0.001$) This indicates that there is a significant difference in leukocytes count between the complicated and uncomplicated types.

Table 5. Correlation of Appendicitis Type with Leukocytes Count.

Appendicitis Type	Leukocytes Count (Min-Max)	P value
uncomplicated	9,000 (3,000-23,000)	0.001
complicated	14,500 (4,000-31,000)	

The results of this study are in line with research conducted by Sophia, Mustaqim and Rizal [15] which compared blood leukocyte levels in acute appendicitis and perforation. The results showed that there was a significant difference in leukocyte levels between the two types of appendicitis with $p <0.05$ ($p <0.001$). Research from Kheru, Sudiadnyani and Lestari [17] also stated that there was a significant difference in leukocyte numbers between acute appendicitis and perforated appendicitis. Kurniadi et al [12] stated that leukocyte counts such as neutrophils, lymphocytes, and monocytes can be used to help classify uncomplicated and complicated appendicitis. The majority of patients with uncomplicated and complicated types of appendicitis did not experience an increase in platelet count (thrombocytosis). Assessment of the relationship between type of appendicitis and platelet count was performed using the Mann-Whitney test. From this test, $p >0.05$ was obtained ($p=0.154$). This indicates that there is no significant difference in AT levels between complicated and uncomplicated types.

Table 6. Correlation of Appendicitis Type with Thrombocytes Count

Appendicitis Type	Thrombocytes Count (Max-Min)	P value
uncomplicated	307,000 (996,000-80,000)	0.154
complicated	272,500 (569,000-156,000)	

This finding is in line with these results, Pérez-Soto et al [18] and AG and Patil [19] also found that there was no association between the type of appendicitis and platelet count values. Although there is no correlation of platelet count with appendicitis, thrombocytopenia secondary to acute appendicitis was reported in 2021 by Poudel et al [20]. Thrombocytopenia is quite common in post-operative patients and is generally caused by hemodilution due to blood transfusion and fluid resuscitation. Compared to platelet count, decreased MPV (mean

platelet volume) is more reliable as a biomarker in the diagnosis of acute appendicitis [19]. MPV is influenced by several cytokines, especially IL-3 and IL-6. MPV will increase in chronic disease and tend to decrease in the acute phase of the disease [21].

4. Conclusion

Appendicitis patients were predominantly female; in the age range of 20-44 years; the most common type was uncomplicated appendicitis; the average length of stay was 5 days; the average leukocytes count was $10,616/\text{mm}^3$; the average thrombocytes count was $323,825/\mu\text{L}$; and the most common complaint was abdominal pain. The characteristics of appendicitis patients are different in each population. Doctors are required to understand the disease and conduct a comprehensive examination so that patients can be treated properly.

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