

# EPIDEMIOLOGICAL-CLINICAL CHARACTERISTICS AND RESULTS OF APPENDICEAL PLASTRON MANAGEMENT IN ADULT PATIENTS FROM A REFERENCE HOSPITAL IN PERU

CARACTERÍSTICAS EPIDEMIOLÓGICAS-CLÍNICAS Y RESULTADOS DEL MANEJO DE PLASTRÓN APENDICULAR EN PACIENTES ADULTOS DE UN HOSPITAL DE REFERENCIA DEL PERÚ

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## ABSTRACT

**Introduction:** Appendicular plastron is considered a progressive form of acute appendicitis, with a national prevalence of 2-10%. Currently management is often controversial. It is that from this context, it seeks to promote studies that can elucidate the variables associated with the management of this condition. **Objective:** to determine the epidemiological-clinical characteristics associated with the results of the management of the appendiceal plastron in adult patients in a reference hospital in Peru. **Methods:** Non-experimental study, with a quantitative approach, observational, analytical and cross-sectional design, whose sample consisted of 100 patients with a diagnosis of appendicular plastron. The data collection sheet was applied as an instrument. Likewise, a Poisson regression model was used to respond to the objectives. **Results:** The multivariate analysis showed that alcohol consumption ( $p<0.05$  RPa=1.12), nausea and vomiting ( $p<0.05$ , RPa=1.48), diarrhea ( $p<0.05$ ; RPa=1.08), duration of symptoms before admission between 3 and 5 days ( $p<0.05$ ; RPa=1.09), appendiceal mass ( $p<0.05$ , RPa=1.18) and bandemia ( $p<0.05$ , RPa=1.12) were significantly associated with unsuccessful management results of the appendiceal plastron. **Conclusion:** There are epidemiological and clinical characteristics associated with the results of the management of the appendicular plastron.

**Keywords:** Appendix; Appendicitis; Evaluation of results of therapeutic interventions. (Source: MESH-NLM)

## RESUMEN

**Introducción:** El plastrón apendicular se considera una forma progresiva de apendicitis aguda, teniendo una prevalencia a nivel nacional de 2-10%. Actualmente el manejo suele ser controvertido. Ante lo expuesto, se busca promover estudios que puedan dilucidar las variables asociadas al manejo de esta condición. **Objetivo:** determinar las características epidemiológico-clínicas asociadas a los resultados del manejo del plastrón apendicular en pacientes adultos en un hospital de referencia del Perú. **Métodos:** Estudio no experimental, de enfoque cuantitativo, diseño observacional, analítico y transversal, cuya muestra estuvo conformada por 100 pacientes con diagnóstico de plastrón apendicular. Se aplicó como instrumento la ficha de recolección de datos. Asimismo, se utiliza un modelo de regresión de Poisson para responder a los objetivos. **Resultados:** El análisis multivariado evidenció que el consumo de alcohol ( $p<0.05$  RPa=1.12), las náuseas y vómitos ( $p<0.05$ , RPa=1.48), diarrea ( $p<0.05$ ; RPa=1.08), duración de síntomas antes del ingreso entre 3 y 5 días ( $p<0.05$ ; RPa=1.09), masa apendicular ( $p<0.05$ , RPa=1.18) y bandemia ( $p<0.05$ , RPa=1.12) se asociaron significativamente a resultados de manejo no exitosos de plastrón apendicular. **Conclusión:** Existen características epidemiológicas y clínicas asociadas a resultados del manejo de plastrón apendicular.

**Palabras clave:** Apéndice; Apendicitis; Evaluación de resultados de intervenciones terapéuticas. (Fuente: DeCS- BIREME)

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## INTRODUCTION

Acute appendicitis is a typical medical emergency worldwide; Peru is no exception since between 2 and 6% present appendicular plastron. An appendicular plastron is a progressive form of acute appendicitis that requires surgical management<sup>(1)</sup>. This is associated with postoperative infectious complications such as intestinal fistula, small bowel obstruction, and recurrence of appendicitis after initially successful non-surgical management<sup>(2-5)</sup>.

Different studies have been developed to determine appendicular plastron characteristics and expected results. According to Laguzzi et al.<sup>(6)</sup>, of the 30% of patients with edematous appendicitis, 37 cases presented appendicular plastron, a risk of occurrence in the population studied. Cano<sup>(7)</sup>, identified that 25% of the total population presented complications after diagnosis and treatment due to appendicular plastron, whereas 15% presented high temperature as the primary clinical manifestation; this caused patients to stay at the hospital for an average of 10 days. In the case of Saar et al.<sup>(8)</sup>, one of the clinical characteristics that was evidenced in patients with appendicular plastron was that 58.8% had hyperleukocytosis. The most common finding method in said population was the abdominal ultrasound (78.8%). Likewise, in Morocco, the epidemiological characteristics found in patients with appendicular plastron were the following: the most common gender was males (20 cases), and the average age was 29 years<sup>(9)</sup>.

In Peru, the frequency of appendicular plastron varies between 2 to 10%; in addition, among the main characteristics identified, it has been shown that it generally occurs in males (53.25%) and in people with an average age of 35 years and usually the time of illness is 8 days<sup>(10)</sup>.

The handling remains controversial; the conservative approach is highlighted by the assumption that the inflammatory process is already localized and that inadvertent surgery may be challenging and unsafe<sup>(11,12)</sup>. Also, it could be difficult to identify the appendix, and sometimes due to unintentional injury, a fecal fistula may develop<sup>(3)</sup>. However, the information available on the subject is scarce. For this reason, identifying the epidemiological and clinical characteristics associated with the results of conservative management is essential and of interest.

Much of the previous research on this topic has focused on whether non-surgical management is safe or feasible. Generally, it focuses on uncomplicated appendicitis and provides little information on the outcomes of patients whose treatment has failed. In this context, the execution of a study was proposed to determine the epidemiological-clinical characteristics associated with the results of conservative management of the appendicular plastron in adult patients from a reference hospital in Peru.

## METHODS

### Design and study area

The study is observational, analytical, cross-sectional, and retrospective. Data collection took place between January 2020 and December 2021. The STROBE checklist was used to assess the study's internal validity<sup>(13)</sup>.

### Population

The population consisted of 100 patients diagnosed with appendicular plastron treated at the José Casimiro Ulloa Emergency Hospital. Regarding the selection criteria, patients between the ages of 18 and 60 of both sexes were included. Pregnant patients diagnosed with COVID-19 were referred to other health centers, and other intra-abdominal pathologies were excluded.

### Variables and instruments

A data collection sheet included epidemiological, clinical characteristics, and management results as its structure. Likewise, it was evaluated by three experts on the subject to find its internal consistency, finding a coincidence of the three experts of 100%. Data collection was carried out in the database of the statistics service of the hospital José Casimiro Ulloa.

### Statistical analysis

The descriptive analysis reported the relative and absolute frequencies for the qualitative variables of the target population. To determine the epidemiological-clinical characteristics associated with the results of the management of the appendicular plastron, the crude prevalence ratio will be estimated with confidence intervals at 95% using a Poisson regression model. Subsequently, the adjusted prevalence ratio will be estimated with 95% confidence intervals for the independent and dependent variables, with those co-variables that present a statistically significant association; for this, a multiple Poisson regression model will be used.





## Ethical aspects

This project was reviewed by the San Juan Bautista Private University's Ethics Committee and the Emergency Hospital José Casimiro Ulloa. However, informed consent did not apply to this study because there was no direct contact with the patients. Instead, the information was obtained from the medical records. In addition, the identity of the patients was kept confidential, for which the records were coded.

## RESULTS

### Univariate Statistics

Within the epidemiological characteristics, it was found that 98% of patients came from Metropolitan Lima, 49% worked independently, and 30% had the habit of drinking alcohol. It was also noticed that only 19% smoked tobacco. (Table 1)

**Table 1.** Epidemiological characteristics variables.

Variables	N	%
<b>Origin</b>		
Metropolitan Lima	98	98.0%
Lima province	2	2.0%
<b>Occupation</b>		
Student	12	12.0%
Independent	49	49.0%
Dependent	13	13.0%
Housewife	26	26.0%
<b>Harmful Habits *</b>		
None	67	67.0%
Alcohol	30	30.0%
Tobacco	19	19.0%

\*Multiple answers for the harmful variable habits

The clinical characteristics showed that 33% of patients self-medicated, 71% presented the disease for up to 7 days, 11% showed a palpable mass on physical examination, and 52% presented a palpable mass of more than 4\*4 cm. Likewise, all presented pain in the right iliac fossa and also 76% presented nausea and vomiting, and 64% presented symptoms less than 3 days before

hospital admission. On the other hand, only 4% presented arterial hypertension as comorbidity, and 2% of patients underwent CT/MRI after 24 hours. In addition, the most frequent imaging finding was the appendicular mass (63%), leukocytosis was the most frequent laboratory finding (84%), and antibiotic therapy lasted up to 10 days in 52% of patients (Table 2).

**Table 2.** Clinical features.

Variables	N	%
<b>Self-medicate</b>		
Yes	33	33.0%
No	67	67.0%
<b>Sick time (days)</b>		
≤ 7 days>	71	71.0%
7 days	29	29.0%
<b>Palpable mass on physical examination</b>		
Yes	11	11.0%
No	89	89.0%
<b>Appendicular mass size</b>		
2*2-4*4cm	48	48.0%
>4*4cm	52	52.0%
<b>Symptoms and signs on admission *</b>		
Pain in the right iliac fossa	100	100.0%
Nausea and vomiting	76	76.0%
Diarrhea	33	33.0%
Fever	23	23.0%
Constipation	3	3.0%
<b>Duration of symptoms before hospital admission</b>		
<3 days	64	64.0%
3-5 days	33	33.0%
>5 days	3	3.0%
<b>Comorbidities</b>		
Arterial Hypertension	4	4.0%
Diabetes Mellitus 2	3	3.0%
<b>CT/MRI performance time</b>		
>24 hours	2	2.0%
<24 hours	98	98.0%
<b>Imaging findings*</b>		
Appendicular mass	63	63.0%
Abscess	16	16.0%
Appendicolith	9	9.0%
<b>Laboratory findings on admission</b>		
Leukocytosis	84	84.0%
Bandemia	19	19.0%
Elevated CRP	4	4.0%
<b>Duration of antibiotic therapy</b>		
≤10 days	52	52.0%
>10 days	48	48.0%
<b>Result of conservative management of appendicular plastron</b>		
Successful	19	19.0%
Unsuccessful	81	81.0%

\*Variables with multiple answers





### Bivariate and multivariate analysis

Alcohol consumption was the only statistically significant epidemiological characteristic associated with an unsuccessful driving outcome, with a p-value < 0.05 and a prevalence ratio of 1.22 (CI: 1.01-1.35). On the other hand, it was observed

that a large part of the patients with unsuccessfully managed in the metropolitan Lima area (98.8%), of which (13.6%) were students. It was also found that (35.8%) consumed alcohol and/or tobacco (23.5%) (Table 3).

**Table 3.** Epidemiological characteristics and results of conservative management of the appendicular plastron.

Epidemiological characteristics	Management results		P-Value	PR (IC 95%)		
	Unsuccessful N	Successful %			N	%
<b>Origin</b>						
Metropolitan Lima	80	98.8%	18	94.7%	0.320	1.27 (0.79-2.02)
Lima province	1	1.2%	1	5.3%		
<b>Occupation</b>						
Student	11	13.6%	1	5.3%	Ref.	
Independent	39	48.1%	10	52.6%	0.229	1.11 (0.94-1.32)
Dependent	9	11.1%	4	21.1%	0.124	1.21 (0.95-1.54)
Housewife	22	27.2%	4	21.1%	0.511	1.07 (0.88-1.29)
<b>Harmful habits*</b>						
None	48	59.3%	19	100.0%	Ref.	-
Alcohol	29	35.8%	1	5.3%	0.000	1.22 (1.10-1.35)
Tobacco	19	23.5%	0	0.0%	-	-

\*Variables with multiple answers// Chi Square test// PR=Prevalence ratio// CI=Confidence intervals

Within the clinical characteristics, it was found that the symptoms and signs on admission, such as nausea and vomiting (p < 0.05, RP: 1.67 IC: 1.49 – 1,86), diarrhea (p < 0.05, RP: 1.14 IC: 1.01 – 1.28),

appendicular mass (p < 0.05, RP: 1.46 IC: 1.31-1.64) and Bandemia (p < 0.05, RP: 1.16 IC: 1.03 – 1.31) were related to results of unsuccessful appendicular plastron management (Table 4).

**Table 4.** Clinical characteristics and results of conservative management of the appendicular plastron.

Variable	Management results		P-value	PR (IC 95%)		
	Unsuccessful N	Successful %			N	%
<b>Self-medicated</b>						
Yes	28	34.6%	5	26.3%	0.474	1.05 (0.92-1.20)
No	53	65.4%	14	73.7%		
<b>Sick time (days)</b>						
≤ 7 days	58	71.6%	13	68.4%	0.786	1.02 (0.88-1.18)
> 7 days	23	28.4%	6	31.6%		
<b>Palpable mass on physical examination</b>						
Yes	11	13.6%	0	0.0%		
No	70	86.4%	19	26.3%	-	-
<b>Symptoms and signs on admission*</b>						
Pain in the right iliac fossa	81	100.0%	19	100.0%	-	-
Nausea and vomiting	74	91.4%	1	5.3%	0.000	1.67(1.49-1.86)



Fever	19	23.5%	4	21.1%	0.819	1.02 (0.88-1.18)
Diarrhea	30	37.0%	3	15.8%	0.041	1.14 (1.01-1.28)
Constipation	3	3.7%	0	0.0%	-	-
<b>Duration of symptoms before hospital admission*</b>						
<3 days	51	63.0%	13	68.4%	Ref.	
3-5 days	27	33.3%	6	31.6%	0.800	0.98 (0.86-1.13)
>5 days	3	3.7%	0	0.0%	-	-
<b>Comorbidities*</b>						
Arterial hypertension	3	3.8%	1	5.3%	0.771	0.95 (0.67-1.34)
Diabetes mellitus 2	2	2.5%	1	5.3%	0.570	0.59 (0.59-1.33)
<b>CT/MRI performance time</b>						
>24 Hours	2	2.5%	0	0.0%	-	-
<24 Hours	79	97.5%	19	100.0%		
<b>Imaging Findings*</b>						
Appendicular mass	62	76.5%	1	5.3%	0.000	1.46 (1.31-1.64)
Abscess	16	19.8%	0	0.0%	-	-
Appendicolith	9	11.1%	0	0.0%	-	-
<b>Laboratory findings on admission</b>						
leukocytosis	68	84.0%	16	94.1%	0.101	0.89 (0.77-1.02)
Bandemia	18	22.2%	1	5.3%	0.015	1.16 (1.03-1.31)
Elevated CRP	4	4.9%	0	0.0%	-	-
<b>Duration of antibiotic therapy</b>						
≤10 days	43	53.1%	9	47.4%	0.654	1.03 (0.91-1.17)
>10 days	38	46.9%	10	52.6%		

\*Variables with multiple answers// Chi Square test// PR=Prevalence ratio// CI=Confidence intervals

The multivariate Poisson regression model showed that alcohol consumption ( $p=0.036$ ), symptoms such as nausea and vomiting ( $p=0.000$ ), diarrhea ( $p=0.033$ ), duration of symptoms between 3 and 5 days ( $p=0.016$ ), the presence

of an appendicular mass as an imaging finding ( $p=0.006$ ) and bandemia ( $p=0.049$ ) were statistically significant characteristics associated with the results of unsuccessful conservative management (Table 5).

**Table 5.** Multivariate analysis of the factors associated with unsuccessful conservative management of the appendicular plastron.

Variable	P-Value	RPA	95% IC	
			Lower	Upper
Alcohol consumption	0.036	1.12	1.01	1.23
Nausea and vomiting	0.000	1.48	1.32	1.67
Diarrhea	0.033	1.08	1.01	1.17
Duration of symptoms before hospital admission 3-5 days	0.016	1.09	1.02	1.17
Appendicular mass	0.006	1.18	1.05	1.32
Bandemia	0.049	1.12	1.00	1.26
(Scale)				





## DISCUSSION

In the present investigation, 100 patients with a diagnosis of appendicular plastron were studied. It was observed that 81% of the patients obtained an unfavorable result regarding the conservative management of the appendicular plastron. In contrast to these results, the study by Haithem<sup>(2)</sup> found that conservative management in patients with appendicular plastron was successful in 84.5% of patients. Debnath et al.<sup>(14)</sup> reported that conservative management was successful in most patients with appendicular plastron (69%). At the same time, Elsaady<sup>(15)</sup>, reported a success rate of 88% and infrequent postoperative complications (9.5%). Olsen et al.<sup>(16)</sup>, identified a 23% failure rate in adult patients with appendicular plastron. The treatment strategy for appendicular plastron is controversial and ranges from image-guided surgery or drainage to conservative management; the latter can prolong the hospital stay; however, the surgical treatment carries the risk of intestinal resection and major complications<sup>(6)</sup>. Contrary to the study results, the available evidence seems to support a conservative approach. The difference between results can likely be explained by the impact of COVID-19 at the time of hospital admission, as well as the decision to prioritize conservative management without any formalized stratification criteria or pathway to guide the choice of this management.

Regarding the epidemiological-clinical characteristics associated with the results of conservative management of the appendicular plastron, it was found that, at the level of epidemiological characteristics, alcohol consumption ( $p < 0.05$ ;  $RP_a = 1.115$ ;  $IC_{95\%} = 1.01 - 1.23$ ) was associated with unsuccessful conservative management results. No studies were found linking alcohol consumption and unsuccessful conservative management; however, it has been suggested that behavioral factors also stand out among the factors related to the outcome of management<sup>(17,18)</sup>. On the other hand, the clinical characteristics associated with the results of the management of the appendicular plastron were identified as the following: symptoms on admission such as nausea and vomiting ( $p < 0.05$ ,  $RP_a = 1.48$ ;  $IC_{95\%} = 1.32 - 1.67$ ) as well as diarrhea ( $p < 0.05$ ;  $RP_a = 1.08$ ;  $IC_{95\%} = 1.01 - 1.17$ ) were associated with an unsuccessful conservative management outcome. The duration of symptoms between 3 and 5 days before hospital admission was considered a

clinical characteristic associated with results of unsuccessful conservative management ( $p < 0.05$ ;  $RP_a = 1.09$ ;  $IC_{95\%} = 1.02 - 1.17$ ). Similar findings were presented by Parmentier et al.<sup>(19)</sup>, who determined that a factor for failure of conservative management where first-line antibiotics were included was a shorter duration of symptoms before admission (5 vs. 4 days  $p < 0.02$ ). Haithem<sup>(2)</sup>, reported that conservative management was ineffective in patients who presented between days 3 and 5 (16.3%) after the onset of symptoms; however, this association was not significant. The presence of an appendicular mass as an imaging finding ( $p < 0.05$ ,  $RP_a = 1.18$ ;  $IC_{95\%} = 1.05 - 1.32$ ) and bandemia ( $p < 0.05$ ,  $RP_a = 1.12$ ;  $IC_{95\%} = 1.00 - 1.26$ ) were clinical characteristics associated with the results. Similar results were identified in a study by Talishinskiy et al.<sup>(20)</sup>, who mentioned that among the variables that predicted the failure of conservative management was the presence of bandemia  $\geq 15\%$  ( $p < 0.01$ ). Likewise, Ayele<sup>(18)</sup>, reported that the study subjects who had a mass in the lower right quadrant before surgical treatment were approximately six times more likely to have unfavorable results.

The present study has limitations inherent to the type of design since it is a single-center study, which implies that it was only carried out in patients from a single hospital, which could affect when extrapolating the data to the population of metropolitan Lima and even more so the national level. However, it has strengths, such as providing evidence in a particular situation such as COVID-19<sup>(21)</sup> and that may have consequences in the management of these patients<sup>(22-24)</sup>.

Among the recommendations, the following should be taken into account. First, to share the study findings among the health personnel of this reference Hospital, to increase the level of knowledge about the management of the appendicular plastron, and to provide information on the patients most vulnerable to non-conservative management. Doing this would prevent complications, prolonging the hospital stay and out-of-pocket expenses. Second, to promote education in patients through educational talks where prevention and the epidemiological characteristics associated with unfavorable results are emphasized. Third, promote adequate care by health personnel. Finally, develop more studies on this subject, including clinical and epidemiological variables associated with conservative management of the appendicular plastron-this way, contrasting study results and contributing to the protocol treatment of this complication.

## CONCLUSIÓN

Alcohol consumption, symptoms and signs on admission such as diarrhea, nausea, and vomiting, duration of symptoms between 3 and 5 days, the presence of a palpable mass, and bandemia as

laboratory findings on admission were characteristics associated with unsuccessful results on conservative management of the appendicular plastron in adult patients.

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