



# The Effect of the SARS-COVID-19 Pandemic in the Epidemiology and the Management of Patients with Acute Diverticulitis: A Comparative Retrospective Cohort Study

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## Abstract

**Aim:** The COVID-19 pandemic caused a decrease in the number of emergency consultations not related to this infection. Our aim is to analyze the impact that this decrease had in the severity of the cases of Acute Diverticulitis (AD) that needed attention from our service.

**Materials and Methods:** Retrospective study of patients assisted in the emergency service between the 1<sup>st</sup> of February and the 31<sup>st</sup> of May 2020, compared to the same period of 2019. The number of consultations in the emergency was analyzed in three phases on both years: 1<sup>st</sup> of February - 14<sup>th</sup> of March; 15<sup>th</sup> of March 30<sup>th</sup> of April; 1<sup>st</sup> to 31<sup>st</sup> of May. We analyze the number of patients, the rate of hospitalization and the degree of complication on the cases of diverticulitis through the text  $\chi^2$ , the exact Fisher test and ANOVA test.

**Results:** Between the 1<sup>st</sup> of February and the 31<sup>st</sup> of May 2020, 27 patients were assessed. In the same period in 2019, 40 patients were assisted, which means a decrease of 32.5%. We did not find significant differences nor in the distribution according to Hinchey classification, neither in the rate of Complicated Diverticulitis (CAD) (40.7% in 2020 vs. 25% in 2019;  $p=0.17$ ).

In the study group, 11 patients were hospitalized, from which 90.9% presented CAD, whereas in the control group, 22 patients were hospitalized, with 45.5% of CAD ( $p=0.02$ ).

**Conclusion:** There was a decrease in the number of consultations for (AD) during the confinement and the severity of cases did not imply clinical relevant differences, although the criteria for hospital admission were stricter.

**Keywords:** COVID-19; Acute diverticulitis; Complicated acute diverticulitis

## Introduction

It is obvious that the SARS-CoV-2 pandemic (COVID-19) has had a sanitary impact and we have had to change the usual assistance we give to our patients in many ways [1,2].

In Spain, and more significantly in Madrid, there has been one of the highest infection rates worldwide, therefore the State of Alarm was established on the 14<sup>th</sup> of March 2020 [3].

Since the approval of the State of Alarm until the beginning of the phase 0 nationwide on the 1<sup>st</sup> of May, the population have remained under home confinement, with their indispensable activities been reduced. The sanitary authorities have emphasized the need of a reasonable use of the emergency services, avoiding visiting the health centre if they were not extremely serious cases. They have also tried to find exceptional solutions to try to minimize the impact of the pandemic and its possible spreading, such as the general use of sanitary Tele assistance.

It would be logical to think that the number of consultations of pathologies different from COVID-19 in the emergency services has decreased by having followed these guidelines. However, there is a number of inflammatory and infectious pathologies whose development without the proper clinical care could cause a deterioration of the illness, with even fatal outcomes in some specific cases [4]. The real impact of the pandemic could have had in these cases has been analyzed in an exceptional way [5].

In this context, we contemplate the idea of carrying out an epidemiologic study about one highly prevalent inflammatory acute bowel disease that is the acute diverticulitis. The main objective of

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our study is to check if there has been a variation in the incidence of the cases of acute diverticulitis during the different periods of the pandemic. Another objective is to evaluate if this decrease in the number of consultations in the emergency services has meant an increase in the seriousness of the disease when the patients received medical attention from our colorectal surgery unit.

## Material and Methods

It is dealt with a retrospective cohort study. A research was conducted by GRDs through the computer system of codification of the information to identify the patients who could be the candidates for the study. We included in our search the following diagnosis: Complicated and non-complicated colon acute diverticulitis. (K 5792, K 5780, K 5781, K 5732, K 5720, K 5721, K 5733 (CIE 10), 562.11 and 562.13 (CIE 9)).

We did a retrospectively data collection from the patients assessed in the emergency systems of a tertiary university hospital (Spain) in the period between the 6 weeks before the approval of the State of Alarm (1<sup>st</sup> of February) and the 31<sup>st</sup> of May, compared to a historical cohort from the same period in 2019.

The variables collected in our study were the patient's age, gender and comorbidities, the diagnosis date, the evolution degree of the acute diverticulitis case according to the Hinchey modified classification, the need of hospitalization and/or urgent surgery [6].

The patients with diverticulitis of Hinchey grade  $\geq$  Ib or Ia with presence of pneumoperitoneum were classified as complicated acute diverticulitis [7].

To compare the results between both groups and to analyze the impact of the COVID-19 pandemic, we have itemized the patients from both cohorts into three groups, according to the diagnosis date and the moment of the State of Alarm was approved by the Government facing the exponential rise in the cases in our country. Hence, we have established three periods: Period 1 (P1) that covers from the 1<sup>st</sup> of February to the 14<sup>th</sup> of March; Period 2 (P2) from the 15<sup>th</sup> of March to the 30<sup>th</sup> of April; and Period 3 (P3) from the 1<sup>st</sup> to the 31<sup>st</sup> of May.

We make a study comparing both cohorts. The continuous variables with a non-normal distribution (Kolmogorov-Smirnov test) are presented as median and Inter Quartile Range (IQR), whereas the ones that follow a normal distribution are presented in average and Standard Deviation (SD). The categorical variables are presented in frequencies. The comparisons among continuous variables were studied through the ANOVA test. The quantitative variables have been compared through the  $\chi^2$  test (or the exact Fisher test, when necessary).

Null hypothesis was rejected when the mistake  $\alpha$  or I type was  $<0.05$ . The differences were considered to be significant with values of  $p < 0.05$ .

The statistical analysis was produced by the program SPSS<sup>®</sup> v.21 (SPSS<sup>®</sup>, Chicago, Illinois, USA).

## Results

We included in the study 67 patients, with an average age of 65.1 ( $\pm$  15.1), from which 41.8% were men. In the period of time studied during 2020, 27 patients were assessed in the emergency services, whereas in the same period in 2019, there were 40. This means a decrease of 32.5%. We did not find differences regarding

**Table 1:** Demographic and relevant comorbidities in the whole sample and in each year of study period.

		Year 2020	Year 2019	Total	p
		n=27	n=40	n=67	
Age (years)*		60.1 (14.5)	67.6 (15.2)	65.1 (15.1)	0.09
Gender	Male	13 (48.1)	15 (55.6)	28 (41.8)	
	Female	14 (51.9)	25 (65.8)	39 (58.2)	0.39
High Blood Pressure		7 (25.9)	15 (37.5)	22 (33.8)	0.32
Dyslipidemia		7 (25.9)	11 (27.5)	18 (26.9)	0.89
Myocardial infarction		3 (11.1)	1 (2.5)	4 (5.9)	0.29
COPD		3 (11.1)	1 (2.5)	4 (5.9)	0.29
Diabetes		4 (14.8)	10 (25.0)	14 (20.9)	0.37
Obesity		9 (33.3)	15 (37.5)	24 (35.8)	0.79
Kidney Disease		1 (3.7)	0 (0)	1 (1.5)	0.4
Current Smoker		4 (14.8)	12 (30.0)	16 (23.9)	0.24

\*Data are shown as mean value and standard deviation, ANOVA test was used for comparison

comorbidities or demographic characteristics between both groups (Table 1).

During the study period in 2020, the proportion of patients assisted in the emergency services with a diagnosis of acute diverticulitis has been progressively lower: 17 in P1, 8 in P2 and 3 in P3. The number of cases during the same study period in 2019 remained steadier with a total of 16 cases in P1, other 16 in P2 and 8 in P3. These differences among groups do not achieve statistically significant differences.

According to the classification of Hinchey, the seriousness of patients during the pandemic period and the comparative group of 2019 has been the same ( $p=0.17$ ), with a vast majority of un-evolved cases (more than 95% of Hinchey Ia and Hinchey Ib in both cohorts). The more evolved cases have remained steady, also in both periods, in absolute terms (Table 2).

Based on the chosen criteria for the classification of the case as complicated, the proportion of patients with complicated acute diverticulitis has been higher during the present year than during the previous one (40.7% vs. 25%;  $p=0.17$ ), although the number of patients in both periods is almost the same.

When comparing the rate of patients hospitalized with a case of diverticulitis between both groups, 11 (40.7%) vs. 22 (55%) patients, we observe that in the study cohort, 90.9% of the hospitalized patients had a complicated diverticulitis opposite to 45.5% in the historical cohort ( $p=0.02$ ).

The type of treatment required in both study periods has not significantly changed either. There has been a clear minority of patients that have required percutaneous drainage or even urgent surgery (14.8% in 2020 vs. 7.5% in 2019;  $p=0.98$ ).

The average stay from hospitalized patients has been higher during the present year, 12.6 days (SD), opposite to 7.6 days (SD 7.6) in 2020 ( $p=0.12$ ).

If we itemize the results obtained by comparing the periods 1, 2 and 3 from both years, we observe that the most relevant differences are seen in period 2 (Table 3). One of this differences is observed in the distribution of patients according to Hinchey classification, in which we see an increase in the number of patients presenting a case of Ib degree during 2020 (50% vs. 6.2%;  $p=0.04$ ). Another difference can be

**Table 2:** Clinical and radiological classification of acute diverticulitis, time elapse of presentation and treatment requirements during the pandemic and the comparative cohort of 2019.

		Year 2020	Year 2019	p
		n=27	n=40	
Number of patients	P1 (February – March 14)	17 (62.9)	16 (40.0)	
	P2 (March 15 – April 30)	8 (29.6)	16 (40.0)	0.02
	P3 (May 1 – May 31)	2 (7.4)	8 (20.0)	
Hinchey Stage	Ia	21 (77.8)	35 (87.5)	
	Ib	5 (18.5)	3 (7.5)	
	II	0 (0)	2 (5.0)	0.19
	III	1 (3.7)	0 (0)	
	IV	0 (0)	0 (0)	
Complicated Diverticulitis		11 (40.7)	10 (25.0)	0.17
	Total	11 (40.7)	22 (55.0)	0.25
	Complicated	10 (90.9)	10 (45.5)	
Hospitalization (n=33)	Uncomplicated	1 (9.1)	12 (54.5)	0.02
Percutaneous Drainage or Surgery	Yes	4 (14.8)	3 (7.5)	
	No	23 (85.2)	37 (92.5)	0.98
Length of stay*		12.6 (9.5)	7.6 (7.6)	0.12

\* Data are shown as mean value and standard deviation, ANOVA test was used for comparison

observed in the percentage of patients with complicated diverticulitis in the total of hospitalized (100% vs. 50%;  $p=0.01$ ), difference that is also observed during period 1 (85.7% vs. 33.3%;  $p=0.01$ ).

## Discussion

Our analysis confirms the decrease in the number of patients in the surgical emergency systems due to the home confinement. Our data are in line with the ones published by diverse European groups that have made an analysis about the decrease in the number of urgent surgeries, although until today, few have emphasized the decrease in the surgical emergency activity [5,8-10]. However, despite having assisted a fewer number of patients with acute diverticulitis, we have not confirmed a significant increase in the complexity of the cases of acute diverticulitis, as it has been speculated in some scientific forums.

Based on the number of patients obtained in each of the stages of the Hinchey classification, it seems that patients have been responsible towards the pandemic, and that the cases that have avoided visiting the emergency systems are precisely those, which are milder, principally Hinchey Ia.

Conversely, one of the main risks of the decrease in the number of consultations in the emergency systems for pathologies, which were not related to COVID infection, has made us wonder if the delay in the diagnosis can have meant an increase in the gravity of the patients who require hospitalization. With the results obtained, we have confirmed that, during the State of Alarm, the patients, who have consult in the emergency systems and/or have required hospitalization in our colorectal surgery unit, have presented a higher percentage of Hinchey Ib type acute diverticulitis, confirming, in some way, the hypothesis raised [4].

However, the number of patients with complicated abscesses that would have required percutaneous drainage, or purulent peritonitis, or even fecaloids, in the present year has been almost zero. Based on these data we can affirm that, despite the small increase in the rage

of Hinchey Ib cases, the differences have not been clinically relevant, and consequently, we consider that the acute diverticulitis spectrum has not significantly changes during the pandemic.

It would be reasonable to think that the anti-inflammatory treatment and the dietary restrictions, treatment measures that could have been applied by patients spontaneously, would have been enough to get a favorable outcome, avoiding complicated development of the illness. These treatment options without antibiotic treatment have showed good results in the appropriate clinical setting and take part in some of the more recent clinical guidelines of some scientific societies such as the American Society of Colon and Rectal Surgeons [7,11-13].

Another interesting datum taken from the sample is the one of the hospitalization in both groups; if we interpret the obtained data, it seems that, during the present year, because of the pandemic, the hospitalization criteria have been much stricter. Most of the hospitalized patients have suffered a complicated acute diverticulitis, whereas in the same period in the previous year up to 54.5% of the cases were non-complicated acute diverticulitis. The fact that 90.9% of the hospitalizations due to acute diverticulitis this year have been patients with cases considered as complicated justifies the fact of being longer in hospital, despite the pandemic and potential risk of infection.

All this makes us wonder about the possibility of using monitoring and home surveillance alternatives that improve the assistance given to these patients such as home hospitalization with Telematics monitoring or Teleconsultation that assure a correct treatment for these pathologies.

Ultimately, the obtained results are perfectly coherent due to the epidemiologic context we have lived in, according to which, most of these patients with mild cases have not visited the hospitals looking for assistance and doctors have been much more restrictive with the hospitalization criteria than in other periods when being in hospital is not a threat.

**Table 3:** Clinical and radiological classification of acute diverticulitis in each pandemic period compared and the comparative cohort of 2019.

			2020	2019	p
<b>Total cases</b>			<b>N=17</b>	<b>N=16</b>	-
<b>Period 1 (February 1<sup>st</sup> to March 14<sup>th</sup>)</b>	<b>Hinchey Classification</b>	<b>Ia</b>	15	15	-
			88.2	-93.8	
		<b>Ib</b>	1 (5.9)	0	
		<b>II</b>	0	1 (6.2)	0.39
		<b>III</b>	1 (5.9)	0	
	<b>IV</b>	0	0		
	<b>Complicated diverticulitis</b>		6 (35.3)	3 (18.8)	0.44
<b>Hospitalization</b>	<b>Complicated</b>	3 (33.3)	6 (85.7)		
	Uncomplicated	1 (14.3)	6 (66.7)	0.01	
<b>Total cases</b>			<b>N=8</b>	<b>N=16</b>	-
<b>Period 2 (March 15<sup>th</sup> to April 30<sup>th</sup>)</b>	<b>Hinchey Classification</b>	<b>Ia</b>	4 (50)	14	0.04
				-87.5	
		<b>Ib</b>	4 (50)	1 (6.2)	
		<b>II</b>	0	1 (6.2)	
		<b>III</b>	0	0	
	<b>IV</b>	0	0		
	<b>Complicated diverticulitis</b>		5 (62.5)	4 (25)	0.09
<b>Hospitalization</b>	<b>Complicated</b>	4 (100)	4 (50)	<b>0.01</b>	
	Uncomplicated	0	4 (50)		
<b>Total cases</b>			<b>N=2</b>	<b>N=8</b>	
<b>Period 3 (May 1<sup>st</sup> to May 31<sup>st</sup>)</b>	<b>Hinchey classification</b>	<b>Ia</b>	2 (100)	6 (75)	1
		<b>Ib</b>	0	2 (25)	
		<b>II</b>	0	0	
		<b>III</b>	0	0	
		<b>IV</b>	0	0	
	<b>Complicated diverticulitis</b>		0	3 (37.5)	1
	<b>Hospitalization</b>	<b>Complicated</b>	0	3 (60)	1
<b>Uncomplicated</b>		0	2 (40)		

However, we still have the uncertainty about whether patients have really remained at home improvising solutions to relieve their pain or they have used alternative methods to avoid visiting the emergency systems to look for medical assistance. Regarding this possibility and taking into account the risk of new outbreaks, a possible solution to this problem would be the possibility of a more fluent communication among general doctors and hospital specialists to resolve doubts about the management or simply to share the responsibility of monitoring of these patients, if necessary. It could also be a good option to consider again the Tele-assistance, this time in the context of a hospital emergency system, where the same specialist could make a phone consultant, a basic screening to identify possible severity criteria, and depending on that, be able to do suggestions more adjusted to each specific case.

It is clear that the present study has some limitations such as the fact of corresponding to just one hospital, its retrospective character and the scarce number of patients. Nevertheless, it presents some strength such as the fact that it is an original analysis of what has happened to a specific and so prevalent acute inflammatory illness, as acute diverticulitis, in a pandemic period.

## Conclusion

As a consequence of the home confinement and the measures taken regarding the COVID-19 pandemic, there has been an important decrease in the number of patients who have consult about diverticulitis in the studied period. There has been a decrease of 32.5% compared to the same period of the previous year, without having seen more seriousness or complexity that implies a clinically significant difference. Conversely, we have seen how this exceptional situation has made us be stricter with the hospitalization criteria due to the high risk of infection inside the hospital.

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