



## Retrospective study of Appendicitis and its Histopathology before and during Covid-19 early lockdown in a Welsh Hospital

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### Abstract

#### Background

The increasing incidence of Covid-19 cases in the UK led to the announcement of a national lockdown on 23<sup>rd</sup> March 2020. We looked at the effect on patient presentation of suspected appendicitis in Glangwili General Hospital in Wales.

#### Methods

There were 60 cases recorded in the histopathology files in the computer system. They included all the cases from the period of January 2020 to June 2020. We looked at the pre-Covid period (January to March 2020) and the early lockdown period (April to June 2020). The national guideline referred to is the 'Association of Surgeons of Great Britain and Ireland'/'Royal College of Surgeons' (RCS) Commissioning guide 2014. The local practice utilizes the above guideline and the physical findings, together with laboratory blood results, inflammatory markers (WBC and CRP), and imaging modalities such as ultrasound and computerized tomography.

#### Results

There were 42 cases of appendicectomy during pre-lockdown from January to March, and 18 cases in early lockdown. The highest cases were in January with 17 cases, whereas 5 cases in June was the minimum during the early lockdown period.

In pre-lockdown period there were inflamed appendix as well as non-acute pathology presenting. On the other hand, there were only acute inflammation of appendix presenting during the early lockdown period.

The imaging modalities used were Computerized Tomography (CT) and Ultrasound (US). 18 cases who had a CT imaging which showed evidence of inflammation were also confirmed histopathologically as acute appendicitis.

#### Discussion

The data shows that only acute surgical emergencies were presenting during the early lockdown period. This suggests that there was a delay to access secondary care possibly due to patient hesitancy and delayed referrals.

**Keywords:** Appendicitis, Covid-19, Lockdown, Histopathology, Introduction

### INTRODUCTION

In response to an increasing incidence of Covid-19 infection in the UK, national lockdown was announced on 23<sup>rd</sup> March 2020. The lockdown led to uncertainties affecting attendances at secondary care

facilities. We analyzed the effect of the early Covid-19 lockdown on patient presentation of suspected appendicitis in a district general hospital. Appendicitis

is one of the most common surgical emergencies which affects 7 to 8% of the population, [1, 2].

The retrospective study was carried out in Glangwili General Hospital in Carmarthen in Wales which is part of the Hywel Dda University Health Board. The hospital serves a population of 187,568.

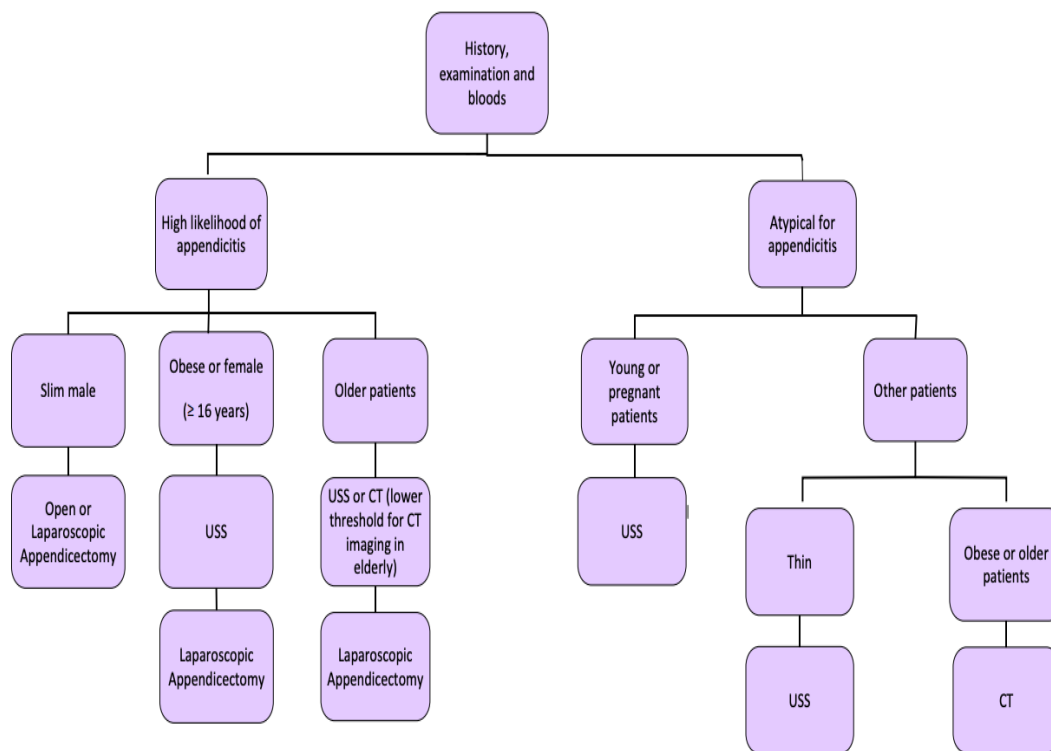
**Aims**

The aims of this study were to correlate the working diagnosis of suspected appendicitis with the histopathological findings, to see how the lockdown affected case presentations, and finally to evaluate the diagnostic workup against national recommendations.

**Standards**

The national guideline for appendicectomy available is the ‘Association of Surgeons of Great Britain and Ireland’/‘Royal College of Surgeons’ (RCS) Commissioning guide 2014 (Figure 1),[2]. Other standard referred to when indicated is the ‘British Association of Pediatric Surgeons’ Pediatric Emergency Appendicectomy pathway 2015.[3] The local practice is based on the above guidelines, and it utilizes the physical findings, together with laboratory blood results, inflammatory markers (WBC and CRP), and imaging modalities such as ultrasound and computerized tomography. Using these findings, a surgical diagnosis of Acute Appendicitis would be made leading to surgical resection.

**Right Iliac fossa/appendicitis flow chart**



**Figure 1. ASGBI/RCS Right Iliac Fossa pain Flow chart (Commissioning guide 2014)**

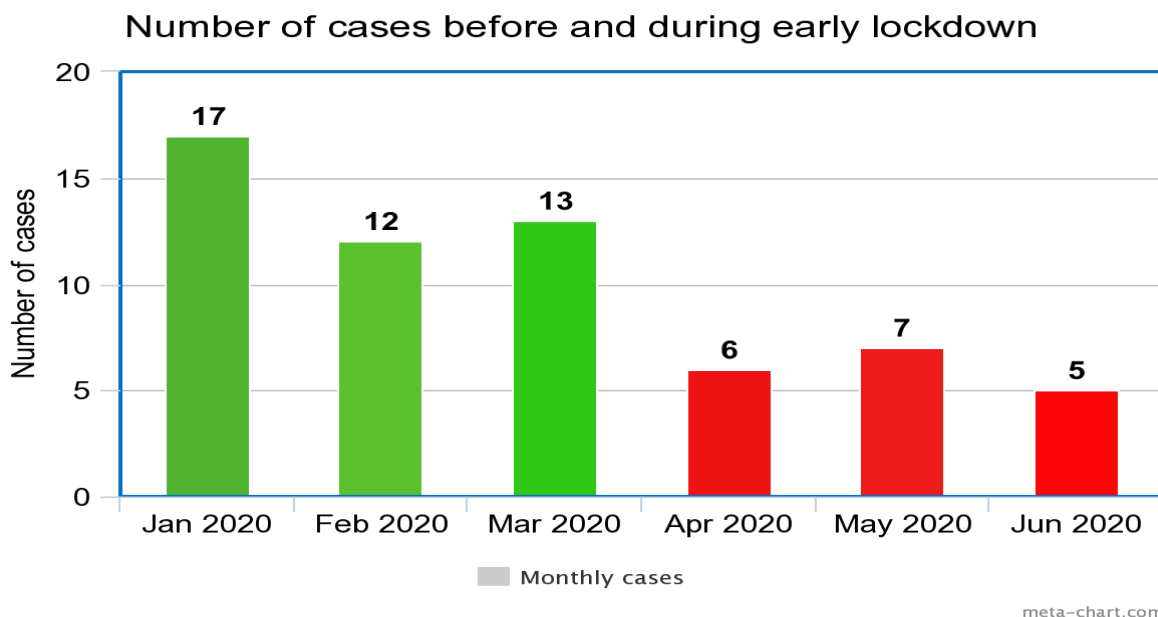
## Methodology

This is a retrospective study where all surgically suspected appendicitis cases as recorded in the histopathology files were included. The period looked at was from January 2020 to June 2020. The pre-Covid period was from January to March 2020, while April to June 2020 was the early lockdown period. The pathological reports of all the cases were collected from the ‘Pathology Laboratory Information Management System’ (LIMS) and further information were gathered from the “Welsh-Patient Administration System” (Welsh-PAS) and the “Welsh

Clinical Portal” (WCP) System. The data was recorded on Excel spreadsheet.

## Results

A total of 60 cases were recorded in the LIMS who had appendicectomy. There were 42 cases during pre-lockdown from January to March 2020. The highest cases were recorded in January with 17 cases (Figure 2). The minimum case load was in June during the early lockdown period with a total of 5 cases. There was more than 50% reduction of cases in the early lockdown period.



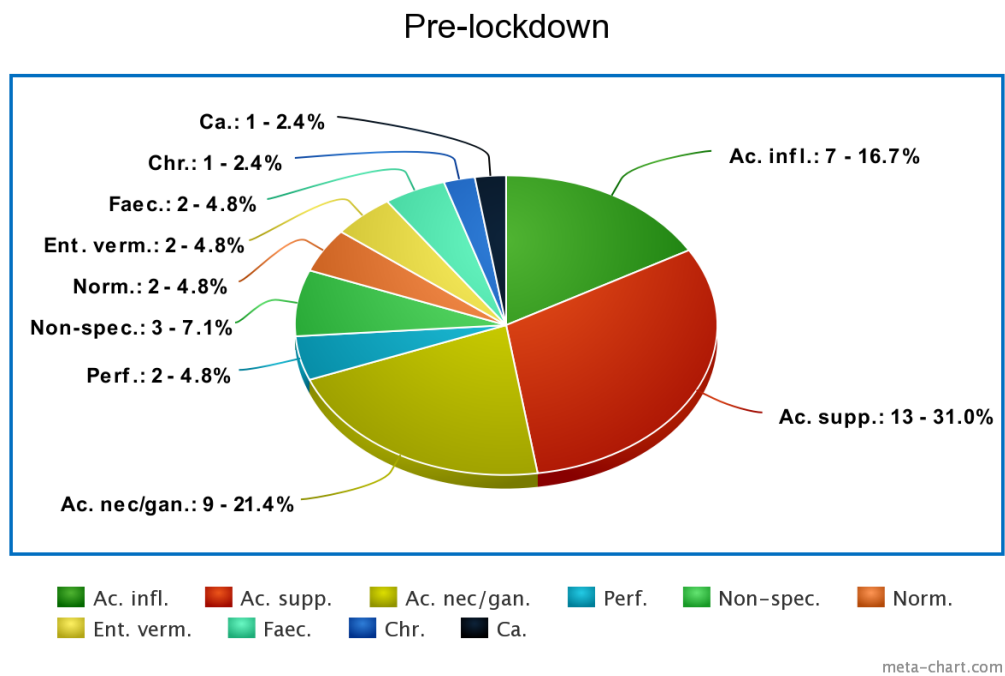
**Figure 2. Monthly case distribution pre- and early lockdown**

The male/female ratio was 50% each in the pre-lockdown period, and this changed to 61% male to 39% female in the early lock-down period. According to Synder (2018), male children and young adults have a higher lifetime risk of 8.6% of developing acute appendicitis,[4].

Out of the 60 cases, 49 (82%) showed an acute inflammatory process. On the other hand, 10 cases (16.7%) showed a non-acute pathology reported as either non-specific inflammation, or a normal specimen documenting the presence of parasitic infestation, faecolith, or fibrous obliteration of the

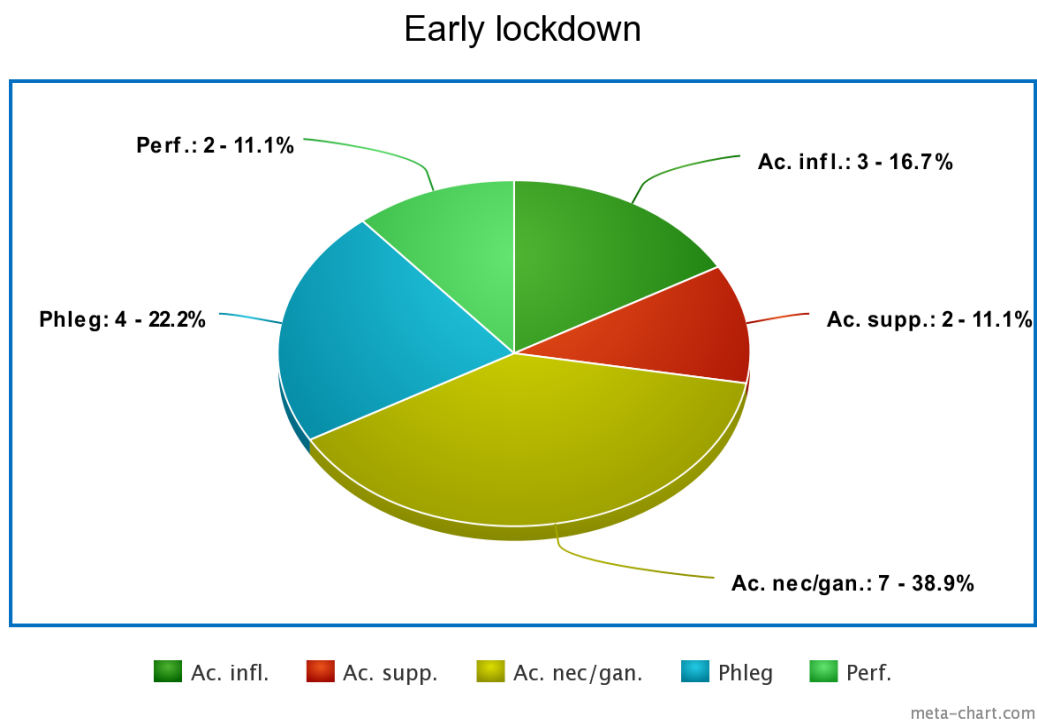
appendix. There was one case of metastatic goblet cell carcinoid of the appendix (low grade goblet cell adenocarcinoma) reported.

During the pre-lockdown period there was a spectrum of pathological diagnoses ranging from an acute inflammatory process in 31 patients to non-acute findings in 11 patients (Figure 3). They were classified as acute inflammation, Acute suppurative, Acute necrotising/gangrenous, perforated, non-specific, normal, enterobius vermicularis obstruction, faecolith obstruction, chronic inflammation, or cancer.



**Figure 3. Pie chart illustrating the histopathological outcomes pre-lockdown in number and percentage**

Early lockdown period consisted of only acute pathological processes with a greater incidence of advanced inflammation with gangrene and necrosis (Figure 4). They were classified as Acute inflammation, acute suppurative, acute necrotising/gangrenous, phlegmonous, or perforated appendicitis.

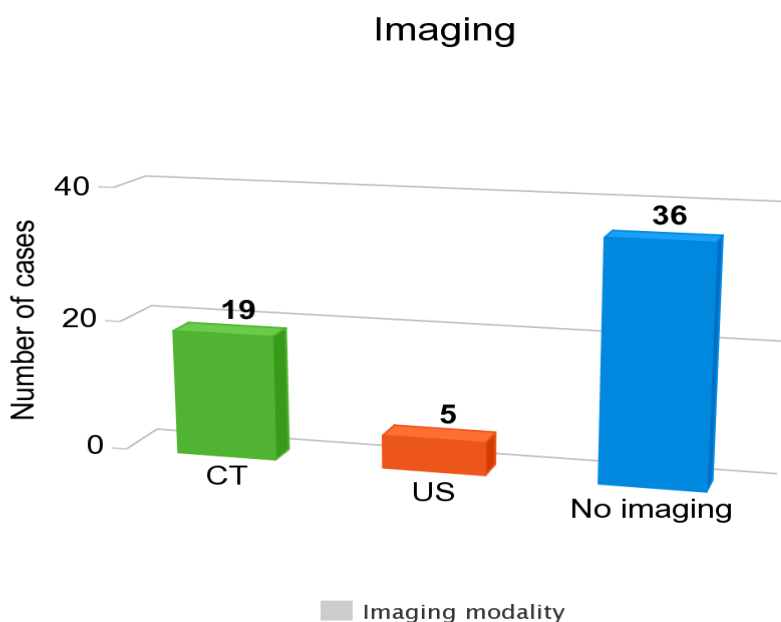


**Figure 4. Pie Chart illustrating the histopathological outcomes during early lockdown in number and percentage**

WBC blood testing was performed in 100% of cases, and CRP testing was carried out in 98%. While the White cell count was within normal range in 34% of cases, an elevated count was present in 66%. The pre-operative C-reactive protein was elevated in 76% of patients. While 24% had a result of less than 10mg/L. Out of the patients who had a rise in both CRP and WBC, 97% had an inflamed appendix.

Preoperative imaging was performed in 40% of cases since they were either obese or were in other categories requiring imaging (figure 5). Out of those

who had imaging, 32% (19) had CT and 8% (5) had an US imaging. No cases had dual imaging. 18 cases who had a CT imaging which showed evidence of inflammation were also confirmed histopathologically as acute appendicitis. There was 1 case of small bowel obstruction at the level of distal Ileum with incomplete small bowel volvulus. The appendix was not visualised in 2 out of the 5 cases who had ultrasound imaging. One was later found to have an acute suppurative appendicitis on the histopathological report.



**Figure 5. Histogram of Imaging modalities.**

Appendicitis remained a clinical diagnosis in 36 cases (60%) where they had supporting laboratory investigations.

**Discussion**

In the pre-lockdown period 26% of cases were non-acute inflammatory processes. The causes included normal appendix, non-specific pathology, obstruction of appendiceal lumen by faecolith, enterobius vermicularis and a fibrosed appendix.

During the early lockdown period there was a 50% reduction in cases presenting with acute abdominal pain considered surgically to be acute appendicitis. All the appendices that were surgically resected were

acutely inflamed while in the pre-lockdown period only 74% were acutely inflamed. The findings suggest that delay to access secondary care due to hesitancy contributed to delayed referral for a surgical review. This appears to have selected out true cases needing surgical intervention. Those cases whose appendix were resected in the early lockdown period had more advanced inflammatory changes in their appendix with perforation and gangrenous change.

Demographically as supported by Synder, the majority of cases in the early lockdown period were young male patients (61%);[4] whereas in the pre-lockdown period the case distribution was equal across both genders.

The study points out that acute appendicitis is primarily a clinical diagnosis supported by laboratory investigations and imaging studies. This highlights the need for clinical acumen and ability in evaluating acute abdomen especially with lower abdominal pain. The majority of cases were in patients under 21 years of age. Zouari et. al (2018) mentioned about the value of CRP  $\geq$  10mg/L as a strong predictor of Acute Appendicitis in children  $<$  6 years of age,[5].

There was a single case of metastatic cancer in the appendix in a 51-year-old patient. It was a goblet cell carcinoid. This indicates the need to always consider that the pathological appendix may harbour a neoplastic process where attention to resection margins and the mesoappendix become more relevant.

Finally, the apparent difference in incidence of acute appendicitis between the pre-lockdown and early lockdown period which also corresponds to first and second quarter of the year could possibly be attributable to seasonal variations. This can be further investigated.

During this unusual period of Covid-19 lockdown the healthcare system responded generally with reduced activity and patients were more apprehensive to avail

secondary care services. Nevertheless, this study has allowed comparison of a period of normal activity to the early lockdown period. The data suggests that only the patients with acute surgical emergencies presented to the hospital in the early lockdown period. This is supported by the fact that the appendices were of advanced pathological processes and could have led to increased morbidity.

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