

# Negative appendectomy rate in Sultan Qaboos University Hospital, Oman

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## To cite this article:

Kamran Ahmad Malik, Adil Aljarrah, Huda Razvi, Laila Al-Khanbashi. Negative Appendectomy Rate in Sultan Qaboos University Hospital, Oman. *Journal of Surgery* Vol. 1, No. 3, 2013, pp. 43-45. doi: 10.11648/j.js.20130103.11

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**Abstract:** Diagnosing acute appendicitis remains a challenge even with the presence of multiple diagnostic tools therefore, normal appendices are removed from some patients thought to have acute appendicitis. This is known as the negative appendectomy rate (NAR). The aim of this study was to find the rate of negative appendectomies in our institution among both adults and children and to analyze the characteristics of this group. The study included 654 patients who underwent appendectomies between January 2009 and January 2011 at Sultan Qaboos University Hospital in Muscat, Oman. The final diagnosis was based on histopathological analysis. The NAR was found to be 12.23% for the entire study population and was found to be 17.7% among children. There was no difference in the NAR between males and females. The NAR was higher than what was found in developed countries and further research needs to be conducted to know the reasons behind this relatively high NAR.

**Keywords:** Negative Appendectomy, Acute Appendicitis

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## 1. Introduction

Acute appendicitis is a common problem that physicians deal with on a day to day basis. Although there has been a lot of progress in the diagnostic tools used, there is still no single investigation that can give a definite diagnosis. Therefore, acute appendicitis remains a clinical diagnosis. This being the situation, removing a normal appendix is an inevitable outcome. This is known as negative appendectomy. The rates of negative appendectomy vary from place to place. For example, a study done in Washington in 2007 showed that the negative appendectomy rate (NAR) was 8.7% (1) while another study done in Pakistan in the same year showed a NAR of 19% (2).

The aim of this study was to find the rate of negative appendectomies in our institution among both adults and children and to analyze the characteristics of the group of patients who underwent negative appendectomies.

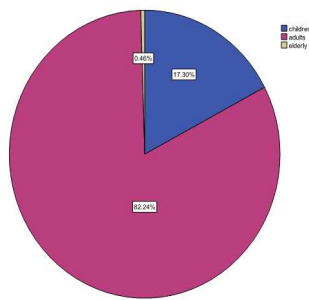
## 2. Methods and Materials

The study looked at 654 of all ages who presented to Sultan Qaboos University Hospital in Muscat, Oman with

symptoms and signs of acute appendicitis from January 2009 to January 2011. The patients underwent open or laparoscopic appendectomy and the appendix was sent to the histopathology lab for diagnosis. Patients who presented with symptoms of acute appendicitis but were found to have a normal appendix at the time of surgery and the appendix was not removed were excluded from the study as were patients whose appendix was not sent for histopathological diagnosis. Data was collected from the operation theatre logbooks and from the hospital's electronic records. Information regarding the patients symptoms, laboratory findings and operative details were gathered and entered into SPSS. It was analyzed using SPSS version 19. Patients 12 years old and below were considered to be children while those between 13 to 59 years of age were considered adults and those 60 years and above were considered elderly.

## 3. Results

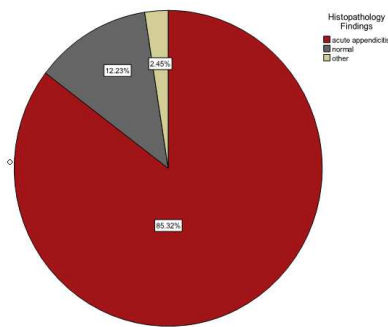
Of the 654 patients included in the study, 17.3% were children, 82.24% were adults and 0.46% were elderly (Figure\_1). 61.2% were males and 38.8% were females.



	Frequency	Percent	Valid Percent	Cumulative Percent
children	113	17.3	17.3	17.3
adults	538	82.3	82.3	99.5
elderly	3	0.5	0.5	100
Total	654	100	100	

Figure 1: Age Distribution.

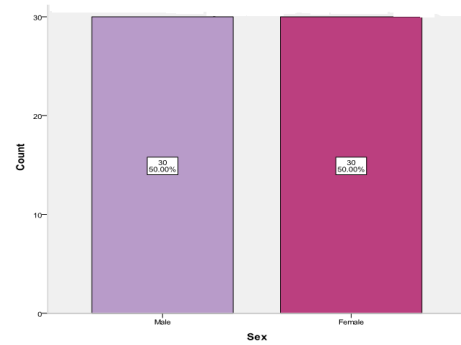
Of the 654 patients who underwent surgery, 85.32% were found to have acute appendicitis, 12.23% were found to have a normal appendix and 2.45% were found to have other pathologies in the appendix (Figure 2). The other pathologies were: fecolith, fibrosis, eosinophilia, chronic inflammation, carcinoid tumor, Entamoeba histolytica infection, and adipose replacement of lumen of the appendix. Thus, the NAR was 12.23%.



	Frequency	Percent	Valid Percent	Cumulative Percent
Acute appendicitis	557	85.2	85.2	85.2
Normal	80	12.2	12.2	97.4
Other	17	2.6	2.6	100
Total	654	100	100	

Figure 2: Percentage of Histopathological Findings in 654 Patients.

A total of 80 patients (12.23%) had a normal appendix histologically. Within this group of patients, 56.25% (n=45) were males and 43.75% (n=35) were females. Even when the children below 12 years old are eliminated, the percent of NAR among adult females and males is still similar with 50% (n=30) of these patients being female and 50% (n=30) being male as shown in (Figure 3).

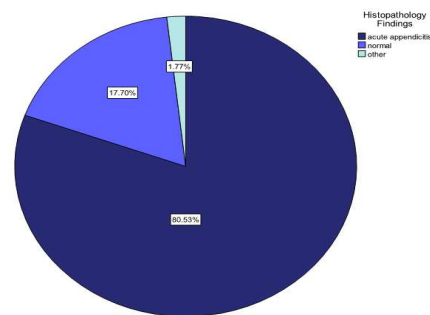


	Frequency	Percent	Valid Percent	Cumulative Percent
Male	30	50	50	50
Female	30	50	50	100
Total	60	100	100	

Figure 3: Percentage of Negative Appendectomies in Male and Female Patients above 12 Years Old.

25% (n=20) of patients with a normal appendix were children below the age of 12. There were no pregnant women in this group.

Children comprised 17.3% of the study population. Within the pediatric group, 80.53% (n=91) were found to have acute appendicitis, 17.7% (n=20) had a normal appendix and 1.77% (n=2) had other pathologies in the appendix (Figure 4). These other pathologies were eosinophilia and Entamoeba histolytica infection. Therefore, the NAR among children was 17.7%.



	Frequency	Percent	Valid Percent	Cumulative Percent
Acute appendicitis	91	80.5	80.5	80.5
Normal	20	17.7	17.7	98.2
Other	2	1.8	1.8	100
Total	113	100	100	

Figure 4: Percentage of Histopathological Findings in Children.

## 4. Discussion

The appendix is a blind-ended tube connected to the cecum, from which it develops embryologically. The cecum is a pouchlike structure of the colon. The appendix is

located near the junction of the small intestine and the large intestine.

The most common diseases of the appendix are appendicitis and carcinoid tumors (appendiceal carcinoid). Appendix cancer accounts for about 1 in 200 of all gastrointestinal malignancies. In rare cases, adenomas are also present.

Appendicitis is a condition characterized by inflammation of the appendix. Pain often begins in the center of the abdomen, corresponding to the appendix's development as part of the embryonic midgut. This pain is typically a dull, poorly localized, visceral pain.

As the inflammation progresses, the pain begins to localize more clearly to the right lower quadrant, as the peritoneum becomes inflamed. This peritoneal inflammation, or peritonitis, results in rebound tenderness (pain upon removal of pressure rather than application of pressure). In particular, it presents at McBurney's point, 1/3 of the way along a line drawn from the anterior superior iliac spine to the umbilicus. Typically, point (skin) pain is not present until the parietal peritoneum is inflamed, as well. Fever and an immune system response are also characteristic of appendicitis.

Appendicitis requires removal of the inflamed appendix, either by laparotomy or laparoscopy. Untreated, the appendix may rupture, leading to peritonitis, followed by shock, and, if still untreated, death.

Making a diagnosis of acute appendicitis is tricky because under-diagnosing risks exposing the patient to complications of appendicitis such as perforation while over-diagnosing will lead to a high NAR and expose patients to unnecessary surgery.

In this study, the NAR for the entire group of patients was 12.2%. While this is a high rate compared to developed countries (1,4,5), it is comparable (and sometimes lower) to what is found in other developing countries (2,6,7,9).

Other studies (7,8,9) have found the high NAR to be partly due to mistaking female gynecological pathologies for appendicitis. In this study this was not the case as the NAR in adults alone was found to be 11.11% with 50% (n=30) of these patients being female and 50% (n=30) being male. Since there is no difference between male and female NAR, we can conclude that female gynecological pathologies are not the reason behind the high NAR.

Among children the NAR was 17.7%. This again was high compared to developed countries (10, 11).

The reason for this relatively high NAR cannot be determined from this study as it has not looked into the method by which the patients were diagnosed with appendicitis (whether it was a clinical diagnosis or based on imaging such as ultrasound or CT scan) nor whether the diagnosis was made by junior or senior doctors. Therefore,

further research is needed to look into these factors.

## 5. Conclusion

NARs in our institution were higher than those in developed countries and this can't be attributed to mistaking female gynecological pathologies for acute appendicitis. The reason for this relatively high NAR cannot be determined from this study as it has not looked into the method by which the patients were diagnosed with appendicitis; therefore, further research is needed to look into these factors

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## References

- [1] Seetahal, SA. Negative appendectomy: a 10-year review of a nationally representative sample. *American Journal of Surgery* 2011, 201 (4): 433-437.
- [2] Kamran, H. Role of total leukocyte count in diagnosis of acute appendicitis. *Journal of Ayub Medical College* 2008, 20 (3):70-71.
- [3] Ditillo, M. Is It Safe to Delay Appendectomy in Adults With Acute Appendicitis? *Annals of Surgery* 2006, 244 (5):656-660.
- [4] Harswick, C. Clinical guidelines, computed tomography scan, and negative appendectomies: a case series. *The American Journal of Emergency Medicine* 2006, 24 (1):68-72.
- [5] Dhupar, R.. Outcomes of operative management of appendicitis. *Surgical Infections* 2012, 13 (3):141-146.
- [6] John SK. Avoiding negative appendectomies in rural surgical practice: is C-reactive protein estimation useful as a diagnostic tool? *The National Medical Journal of India* 2011, 24 (3):144-147.
- [7] Limpawattanasiri, C. Alvarado score for the acute appendicitis in a provincial hospital. *Journal of the Medical Association of Thailand* 2011, 94 (4):441-449.
- [8] Engin, O. Gynecologic pathologies in our appendectomy series and literature review. *Journal of the Korean Surgical Society* 2011, 80 (4):267-271.
- [9] Ma, KW. If not appendicitis, then what else can it be? A retrospective review of 1492 appendectomies. *Hong Kong Medical Journal* 2010, 16 (1):12-17.
- [10] Oyetunji, TA. Pediatric negative appendectomy rate: trend, predictors, and differentials. *The Journal of Surgical Research* 2012, 173 (1): 16-20.
- [11] Bachur, RG. Diagnostic imaging and negative appendectomy rates in children: effects of age and gender. *Paediatrics* 2012, 129 (5):877-884.