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FREQUENCY OF NORMAL APPENDECTOMY AT DIVISIONAL HEADQUARTER TEACHING HOSPITAL MIRPUR AZAD JAMMU KASHMIR

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Abstract

Background: *The removal of a normal (negative) appendix continues to be a difficult task in surgery, adding to the risks incurred, slower healing time and added medical costs. The discrepancy in reports regarding acceptable negative appendectomy rates highlights the importance of local data in guiding surgeons' decisions.*

Objectives: *1) to determine the frequency of normal appendectomy in patients undergoing appendectomy at the General Surgery Department, DHQ, Mirpur, AJK.*

Duration: *Six months w.e.f. 02-09-2024 to 20-03-2025*

Methodology: *After the hospital review committee approved the study, 200 adult patients (18–60 years old) with Alvarado scores of 7.0 or higher were enrolled at participating hospitals. The research participant signed a consent form, and documented their age, gender and BMI. The procedure was done by a senior consultant on all patients using general or spinal anaesthesia. Because of protocols in the department, a surgical approach was selected via either an open or laparoscopic approach. The microscopic examination of removed appendices determined that absent necrosis or neutrophil infiltration indicated a normal appendectomy. Confounders were identified using specific exclusion criteria.*

Results: *The middle age for the cohort was 29.4 years; 120 of them (60.0%) were male, and 80 (40.0%) were female. Sixteen children had a BMI of less than 25 kg/m², and thirteen had a BMI of 25 kg/m² or greater. All the patients in the cohort had an Alvarado score of 8.2 ± 0.7, demonstrating that doctors were very suspicious of appendicitis in this group. Most procedures, or 195 (97.5%), were performed using an open method, and the remaining 5 (2.5%) were surgical laparoscopies. Younger patients had normal histological findings in approximately 10% of the examined appendices (20 out of 200). The rate of negative appendectomy was 10.8% for males and 8.8% for females (p = 0.62), 9.2% for patients with a BMI under 25 and 12.9% for those with a BMI of 25 or over (p = 0.38), and 10.3% for open surgeries and none for laparoscopic surgeries (p = 1.00).*

Conclusion: *Among all these patients, negative appendectomy happened in 10% of cases and was not closely linked to either gender, BMI or the method used. These data suggest a low level but also point out areas where possible improvement is needed in the selection process for patients undergoing surgery.*

INTRODUCTION

Acute appendicitis makes up a large portion of urgent and emergency surgeries carried out all over the world **(1)**. Open or laparoscopic appendectomy is still considered the primary treatment for acute appendicitis **(2).** Nonetheless, modern imaging methods still reveal that around one in five appendectomies shows a normal appendix with no evidence of disease, which is known as a 'normal' or 'negative' appendectomy **(3)**. Negative appendectomy can result in unnecessary risks from surgery, a more difficult recovery, higher costs for care and legal consequences **(4)**.

Because its symptoms can often resemble those of other abdominal or gynaecological ailments, acute appendicitis is especially hard to diagnose in women **(5)**. The Alvarado score, along with the use of equipment such as ultrasound and CT scans, is now employed to enhance the accuracy of patient diagnosis **(6)**. Even so, the bad outcomes from appendectomies are still common in many parts of the world and healthcare organizations **(7)**.

According to Ishaq et al. (2021) from the UAE, the rate they found was 17.0% **(8)**. Meanwhile, Chaochankit et al. shared data from Thailand with a rate of 8.6% **(9)**, and Jamal et al. showed results from Pakistan at 6.9% **(10).** Such results differ due to changes in how patients are treated, diagnosed, and cared for by surgeons.

Since there is much discussion in existing research about the normal rate of appendectomy, it has become difficult for surgeons, especially in poor regions, to determine if and when to do surgery without hesitation. With diagnostic imaging not always available everywhere, doctors in Pakistan typically make their surgical decisions mainly based on the information gathered through the patient's medical history and examination. Consequently, this study aimed to determine the frequency of appendectomies performed at the Divisional Headquarters Teaching Hospital Mirpur, AJK, in order to inform the development of better clinical guidelines that reduce unnecessary surgeries.

METHODOLOGY

The study was conducted in the Department of General Surgery at the Divisional Headquarters Teaching Hospital, Mirpur, AJK, from September 2, 2024, to March 20, 2025, following clearance from the hospital's review committee. Using a 95% confidence level, a 4.3% margin of error, and a predicted frequency of normal appendectomies at 8.6%, the WHO sample size calculator recommended 200 cases. Individuals were recruited in a non-probability consecutive sequence.

Patients were eligible if they were both male and female, 18 to 60 years old, had acute appendicitis meeting the operational definition by the Alvarado score and were planned for appendectomy. Patients who underwent appendectomy as part of unrelated surgical procedures or due to malignancies, pregnancy, uterine fibroids, or an inflamed appendix were excluded from the study.

Of the patients who met the guidelines, 200 provided written and informed consent to participate in the study. All the important details about the patients and their clinical information were captured on a prepared form. Surgery was conducted either with general or spinal anaesthesia, according to the patient's suitability and the surgeon's decision, by a single consultant surgeon to avoid differences in the treatments. Procedures in this field were followed as usual. Following surgery, all appendix samples were sent to a pathology lab, and a senior pathologist examined every one. Specimens were categorized as "normal" when no necrosis or increased neutrophils were present and "inflamed" when histopathology indicated appendicitis. The leading researcher recorded all the information. A carefully selected group of participants helped to control for confounders.

RESULTS

Appendectomies were performed on 200 patients involved in the study who presented to General Surgery Department at the Divisional Headquarters

Teaching Hospital in Mirpur, Azad Jammu and Kashmir (AJK). Participants' average age was 29.4 years. The study included 120 men (60.0%) and 80 women (40.0%). According to body mass index (BMI), the mean for all subjects was 24.8 kg/m², with a standard deviation of 3.2 kg/m². Of 200 patients, approximately two-thirds (65.0%) had a BMI not exceeding 25 and one-third (35.0%) had a BMI of 25 or higher—typical for adults. A uniformly high level of suspicion for appendicitis was observed, as indicated by the cohort's mean Alvarado score of 8.2 ± 0.7.

Most patients, 195 or 97.5%, underwent open appendectomy compared to only 5 or 2.5% who had the laparoscopic procedure due surgeon preferences. The details related to demographic information and the procedure are collected in Table 3.1.

The study of these specimens revealed that 20 patients (10.0%) had normal appendices, which were considered to be a negative appendectomy, as shown in Table 3.2.

Analysis of specific groups revealed that more males (10.8%) underwent normal appendectomies than females (8.8%), although this difference was not statistically significant (p = 0.62). Negative appendectomy occurred just over 12% of the time in patients whose BMI was 25 or greater but slightly less often for patients with a BMI of less than 25 (9.2%). Intriguingly, none of those given laparoscopic appendectomy had a normal appendix (0.0%), while 10.3% of those having open surgery did, but the difference was not significant. Therapeutic associations for each medication are listed in Table 3.3. Figure 4.1 below illustrates appendectomies performed on patients from each BMI category, and Figure 4.2 presents the same information for types of procedures.

Table 3.1: Demographic Characteristics of Patients in the Research (n = 200)

Variable	Value
Age (years)	29.4 ± 8.9
• 18–35 years	176 (88.0%)
• 36-60 years	24 (12.0%)
Gender	
• Male	120 (60.0%)
• Female	80 (40.0%)
BMI (kg/m²)	24.8 ± 3.2
• < 25	130 (65.0%)
• ≥ 25	70 (35.0%)
Type of Procedure	
• Open Appendectomy	195 (97.5%)
• Laparoscopic Appendectomy	5 (2.5%)

Table 3.2: Frequency of Normal (Negative) Appendectomy (n = 200)

Histology	Frequency (n)	Percentage (%)
Normal Appendix	20	10.0%
Inflamed Appendix	180	90.0%
Total	200	100.0%

Table 3.3: Stratification of Normal Appendectomy Frequency by Variables

Subgroups	n	Normal Appendectomy n (%)	P-value
Age (years)			
• 18–35 years	176	19 (10.8%)	0.51
• 36-60 years	24	1 (4.2%)	
Gender			

• Male	120	13 (10.8%)	0.62
• Female	80	7 (8.8%)	
BMI Category			
• < 25	130	12 (9.2%)	0.38
• ≥ 25	70	9 (12.9%)	
Type of Procedure			
• Open Appendectomy	195	20 (10.3%)	1.00
• Laparoscopic Appendectomy	5	0 (0.0%)	

Statistical significance was determined using the Chi-square/Fisher's Exact test, with a p-value threshold of ≤ 0.05

Figure4.1: Frequency of Normal Appendectomy by BMI Category

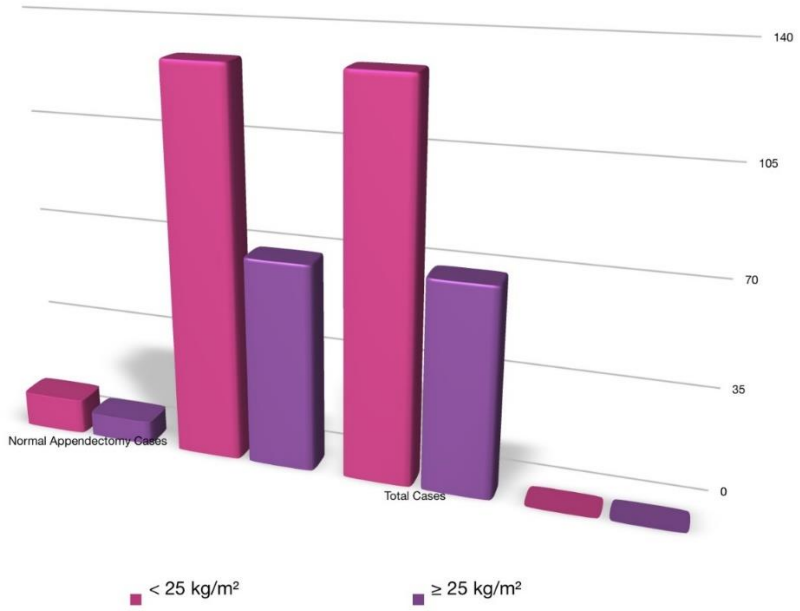
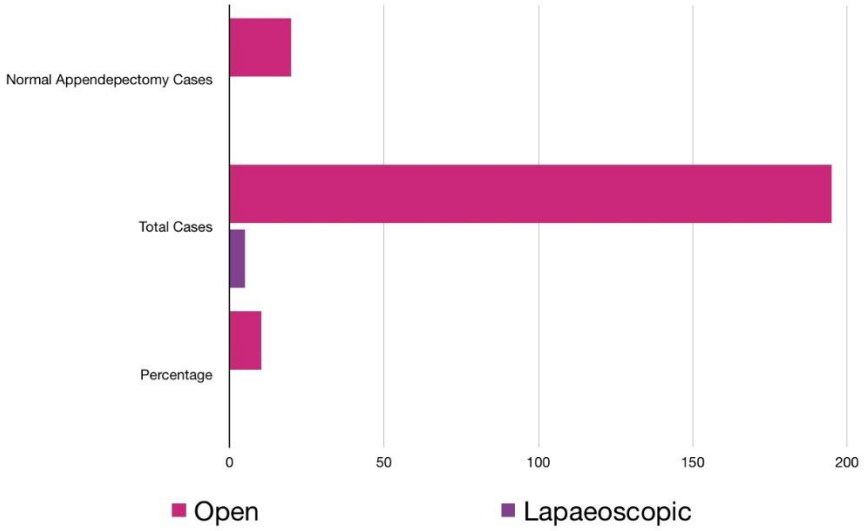


Figure 4.2: Frequency of Normal Appendectomy by Type of Procedure



DISCUSSION

According to the study, about one in every ten patients had no abnormal findings in the appendix. Considering both age and gender, no significant difference in rates was observed (10.8% in those aged 18–35 compared to 4.2% in those aged 36–60; 10.8% in males compared to 8.8% in females; $p = 0.51$ and $p = 0.62$, respectively). There was no significant difference in these results based on BMI (9.2% for BMI < 25 vs. 12.9% for BMI ≥ 25; $p = 0.38$). Everyone who had laparoscopic appendectomy showed disease in the appendix, but 10.3% of those who underwent open appendectomy had a healthy appendix ($p = 1.00$).

Normal appendectomy is reported at a broader range of rates around the world. The rates have fallen to single digits at places where frequent imaging is performed. According to Tseng et al. (USA), the rate of normal appendectomies (NAR) was 4.5% when computed tomography (CT) was the primary diagnostic modality **(11)**. A similar trend was reported by Shieh et al. (USA) in children, with a NAR of 6.5% **(12)**. Moreover, a recent review by Eddama et al. found that modern imaging decreases NAR to between 5–10 per cent **(13)**. At the same time, developing countries typically experience higher rates of poverty. Chaochankit et al. (Thailand) reported an NAR of 8.6%, as per their study **(14)**, whereas Covarrubias-Ramírez et al. (Mexico) found an NAR of 11.7% **(15)**. A review by Donald et al. (UK) found that 38% of patients in a pediatric series had a negative appendectomy, underlining the difference caused by different medical systems **(16)**.

Younger adults in study had a higher rate of NAR, as previous studies have also discovered, as seen in Chaochankit et al.'s findings **(14)**. In comparison to studies that show mostly female patients having negative appendectomies, the study did not observe any significant gender difference. According to Chaochankit et al., an overwhelming majority of those who had normal appendectomies were females since gynecologic problems can resemble appendicitis **(14)**. Fewer women may be involved in these studies due to the population's composition or the method of diagnosis.

In the study, BMI did not strongly predict NAR, as reported in the literature, which scarcely mentions BMI as a helpful factor in predicting normal appendectomy **(13)**. It means that using BMI to measure surgical risk should not be as important as using it for accurate diagnosis of appendicitis.

Reducing NAR depends significantly on the use of diagnostic strategies. They found that CT imaging reduced the proportion of non-atrial arrhythmias to 2.5%, while non-selective ultrasound found them in 9.7% of cases **(11)**. In their study, although over three-quarters relied on the Alvarado score and ultrasound, the high NAR was attributed to the lack of access to CTs around the clock **(15)**. It demonstrates that scoring alone is inadequate and that incorporating imaging into diagnostics can be beneficial when available.

The range in normal appendectomy rates worldwide is influenced by variations in the way people are diagnosed, access to imaging, and the surgical or treatment guidelines in each location. Lower NAR is observed in countries where CT and MRI are accessible; however, when clinical judgment and scoring systems are employed, higher NAR trends are noted **(13,14,15)**. Higher NARs among children and women are caused by similar symptoms experienced in other conditions of the abdomen or female reproductive organs **(12,16)**.

Countries like Pakistan must prioritize cutting down on non-urgent appendectomies to allocate scarce medical resources better. With any surgery, limited supplies must be used, and risks like infection, problems from anaesthesia and slow recovery exist. All patients who had laparoscopic surgery had appendicitis diagnosed by more accurate criteria or more effective imaging. If Alvarado scores are obtained and a set of observation or ultrasound tests are performed, patient outcomes can be improved without the additional cost of many expensive imaging exams **(15)**.

The research encountered certain restrictions. Results from this single-centre study may not be generalizable to other institutions. Since the number of laparoscopic cases did not add up to a sufficient number, it was not possible to draw definitive conclusions. The criteria for histology were standardized, but some differences between pathologists remain. Future comparative cross-country studies in health systems are needed to confirm and expand on these observations. Moreover, evaluating the cost of imaging strategies can provide

important input for developing policies and establishing protocols.

In agreement with recent international findings, the data here showed a 10% rate of negative appendectomy among these patients. There is global evidence that CT scans play a significant role in reducing the number of unnecessary surgeries. It supports the use of clinical scores with simplified imaging options in situations with limited resources, thereby improving diagnosis. Surgical quality assurance programs rely on monitoring NAR everywhere.

CONCLUSION

In conclusion, 10.0% of patients during appendectomy showed no abnormality in their appendices. Appendectomy type, gender, age group and BMI were not linked to negative (normal) appendectomy being performed more frequently. The results emphasize that improving the accuracy of patient diagnosis prior to surgery remains crucial in resource-constrained settings. If clinical scores are combined with selective imaging, fewer surgeries may be required, and patients may experience better outcomes at a lower cost to hospitals.

LIMITATIONS & RECOMMENDATIONS

The advantages of this research are driven by its focused plan, standard technique and the continuous use of histopathology to determine usual appendectomies. This work provides valuable insights into the effects of appendectomy in low-resource hospitals. Even so, the study has several limitations, including being conducted in a single location, involving a moderate number of patients, and not incorporating CT scans as part of the standard imaging process. Because there are so few laparoscopic cases, it is challenging to generalize results about surgical techniques. Further research could be conducted in multiple study settings using advanced imaging techniques to assess the accuracy of these observations. Work should continue to ensure that diagnostic steps are improved to decrease the likelihood of negative appendectomies in developing countries.

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Authors Contribution

Author 1

Assisted in planning and carrying out the study.
Contributed to the understanding of the findings.
The manuscript was composed through independent and original writing efforts.
Final approval for publication was granted.
Takes on the whole job and will work to deal with any concerns about the work being correct or accurate.

Author 2

Took part in important parts of the study's planning and helped create the research concept.
Took part in analyzing the information and creating the manuscript.
Reviewed the project and suggested important changes.
Gave final approval for publication.
Agrees to take on all responsibility for the work and to fix any doubts about its accuracy or completeness.

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APPENDIX-I: Alvarado Score

Symptoms	**Score**
Migratory right iliac fossa pain	1
Anorexia	1
Nausea/Vomiting	1
Signs	
Tenderness in right iliac fossa pain	2
Rebound tenderness	1
Elevated temperature (≥37.3°c)	1
Laboratory Findings	
Leucocytosis (WBC >10,000/mm³)	2
Neutrophilic Shift (Left shift)	1
Total Score	**10**

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