

Clinicopathological Review of Appendicectomy Specimen in a Tropical Mission Hospital: A Cross-Sectional Cohort Study

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Abstract: Acute appendicitis constitutes one of the most common surgical conditions, and the significance of uniquely related clinical entities in the diagnosis remains controversial. It is a disease of the children and young adults but covering all the age groups. This study aims to ascertain the various lesions of the appendicectomy specimen in a tertiary hospital setting, northwestern of Cameroon.

METHOD: This retrospective cross-sectional descriptive study was conducted to do a critical appraisal on the histopathology reports of all appendectomy specimens submitted to the Pathology department, Central Laboratory of a Tertiary Hospital, Northwestern region of Cameroon from January 2011 to January 2016. Patient's socio-demographical data, clinical presentations were extracted from the request form. The data were analyzed using SPSS version 22, thereafter presented with descriptive and inferential statistics.

RESULTS: During the 5-year study period under review, an estimated 683 appendicectomy specimens were received, constituting about 12% of the overall total samples. The age of patients in this study is ranged between 14 and 78 years, with an overall interquartile median of 20.12 ± 5.12 years. Histopathologically confirmed acute appendicitis was found in 86.9% of our cases, while other lesions constitute 13.1%, and negative appendectomy occurred in 4.5% of the cases.

CONCLUSION: The incidence of acute appendicitis remains low, especially in the rural communities of Africa. We, therefore, conclude that the current study spanned the entire gamut of pathological processes that involve the appendix and provides a fair idea about the clinicopathological correlation in appendectomy specimens.

Keywords: Acute abdomen; Appendix; Appendectomy; Histology; Tertiary-hospital setting.

1. INTRODUCTION

Globally, in most hospital settings, there is a strict reliance on typical history and examination findings from where a clinical diagnosis of acute appendicitis (AA) is most frequently made to date. In many such instances, we often do not know the etiology of AA, but several risk factors have been suggested, which are multifactorial, probably luminal obstruction, dietary, and familial factors [1–3].

Appendectomy remains the first option of treatment. Many centers are now performing a laparoscopic procedure to a more considerable extent [2]. AA is a disease of the children and young adults but covering all the age groups. It constitutes one of the most common surgical conditions worldwide, and the frequency of occurrence of AA varies with geographical location [3]. The raw estimate of the incidence of AA is 21 cases per 10,000 populations in the United States of America [4]. Some literature suggests that the disease is more common in whites than non-whites [4–7]. Appendicitis has been found to account for an annual estimate of 40,000 hospital in-patient admissions in England [6, 7].

There are very few reports on appendicitis in Cameroon up-till date; a similar account by Ngowe Ngowe *et al.* [8] reported the incidence rate of 4.6% for AA. In other sub-Saharan Africa like Nigeria, “the incidence of AA is relatively

low with an estimated average frequencies ranged between 22.1 and 49.8 new cases per annual; but in other African countries, the frequencies are relatively higher which ranged between 22.9 and 129 new cases per 100,000 persons per annual" [7, 9–13]. Studies on clinicopathological lesions of the appendix are relatively few amongst the African population. This study aims to ascertain the various lesions of the appendectomy specimen in our center and compare our findings with other reviews elsewhere.

2. OBJECTIVES OF THE STUDY

- 2.1 PRIMARY OBJECTIVE:** These include: 1) To evaluate the clinical presentations of AA in a tropical tertiary hospital setting, Cameroon. 2) To correlate such clinical features with the pathological findings of resected appendix specimens.
- 2.2 RESEARCH QUESTION:** 1) What are the various lesions of appendectomy specimens in our center? 2) Do such lesions compare relatively with findings with other studies elsewhere?
- 2.3 HYPOTHESIS:** There are no significant differences in the clinicopathological lesions of the appendix in the contemporary tropical African population compared with other studies elsewhere.

3. PATIENTS AND METHODS

3.1 STUDY DESIGN AND SETTING

This retrospective cross-sectional descriptive study was conducted to provide a critical appraisal on the histopathology reports of the entire appendectomy specimens submitted to the Pathology department, Central Laboratory of a Tertiary Hospital, Northwestern region of Cameroon from January 2011 to January 2016. The Central Laboratory is a referral center for several government district hospitals, private hospitals, and other mission hospitals in the northwestern region and its environs.

3.2 STUDY POPULATION AND PROCEDURE

The Northwestern region is a rural community with a population of 1,753,460 people (2016 Cameroon Population-Census). A pretested proforma, which was developed by the researcher, was used for data collection. Patient's socio-demographical data, clinical presentations were obtained from the completed laboratory request forms. In most of the cases, routine hematoxylin and eosin (H&E) staining were carried out, and additional histochemical studies were applicable. Alcian blue/Periodic Acid Schiff stain was done for any case of suspected mucocele.

3.2.1 The validity of Instrument

The validation of proforma was equally carried out before the commencement of the data collection by the relevant experts in that area.

3.2.2 Reliability

The reliability instrument of choice that we adopted was the test-retest method. Invariably the result obtained was 0.8.

3.3.3 Statistical Analysis

The data collected were computed into an excel database and analyzed using the Statistical Package for the Social Sciences (SPSS) version 22. Besides, the data were subsequently presented with descriptive and inferential statistics comprising of frequency, age, and sex distribution, nature of clinical signs and symptoms, as well as histological characteristics of the appendectomy lesions.

3.3.4 Ethical Considerations

Ethical approval was obtained from the Institutional Ethical Committee. Confidentiality was ensured by not writing the names of patients on the proforma per Helsinki declaration of 1964.

3.3.5 Reporting

The inclusive reporting style adopted in this study utilized the STROBE / STROCCS guidelines [14, 15].

4. RESULTS

4.1 PARTICIPANT CHARACTERISTICS

During the study period of five years between January 2011 and January 2016, an estimated 683 appendix specimens were received in the Histopathology department, Central Laboratory of our Tertiary Hospital, constituting about 12% of total samples. There were a total of 273 and 410 cases, which represented males and females, respectively, with a male to female ratio of 1:1.5. The age of patients in this study is ranged between 14 and 78 years, with an overall interquartile median of 20.12 ± 5.12 years. Histopathologically confirmed AA was found in 86.9% of our cases, while other lesions constitute 13.1%, and negative appendectomy occurred in 4.5% of the cases. The number of cases per year for the five year study period was 96, 98, 102, 106, and 108, representing figures for 2011, 2012, 2013, 2014, and 2015, respectively.

4.2 AGE AND SEX DISTRIBUTION

The age and sex distribution of the patients is shown in Table 1. In this study, the highest number of cases occurred in the age group 20–29 years closely followed by age group 10–19 years both constituting over 60% of the cases. The least number of cases (12 cases) occurred in the age group 60–78 years representing 1.8%.

4.3 CLINICAL PRESENTATION

The symptomatology in this series revealed that right iliac abdominal pain was the most common form of a presentation by our patients, representing 92%, which later became generalized in 24.8% of cases. The other symptoms include fever, vomiting, and loss of appetite, constituting 72%, 58%, and 46%, respectively. The mean duration of symptoms was 4.05 days. There were twelve cases of perforation at the surgery, of which 2 out of these presented primarily in shock. The average postoperative hospital stay was 5.5 days, with a range of 4–14 days. There was no record of mortality in this study.

4.4 HISTOLOGICAL DIAGNOSIS

The distribution of histological diagnosis is as shown in Table 2. The normal appendix was found in thirty-one (4.5%) cases. We observed uncomplicated acute appendicitis in 60% cases and complicated acute appendicitis (i.e., with peritonitis) in 20% cases. Submucosal fibrosis, schistosomiasis, lymphoid hyperplasia, and subacute appendicitis constitute 5.5%, 1.0%, 3.4%, and 4.4%, respectively. Others include eosinophilic appendicitis (1.0%), both endometriosis and mucocele were seen in seven patients (1.1%). The histology of AA, acute appendicitis with lymphoid hyperplasia, schistosomal appendicitis, also carcinoid tumor, are all displayed in Figures 1–4. As seen in Table 1, we established that acute appendicitis with peritonitis has a higher frequency in males than in females; with a male to female ratio of approximately 2:1. There were more cases of AA in the third decade of life (i.e., age group 20–29 years) constituting 33.1% and closely followed by age groups 10–19 years and 30–39 years constituting 29.5% and 15.8% respectively. The distribution of patients with their various histological diagnoses to their nature (i.e., non-neoplastic and neoplastic lesions) is as shown in Table 3. There were 3 cases (0.5%) of such neoplastic lesions and 680 cases (99.5%) of non-neoplastic lesions of the appendix in the overall analysis.

5. DISCUSSION

5.1 EPIDEMIOLOGIC CONSIDERATIONS

In this study, our central hospital laboratory has an appendix as the most common specimens received for histopathological examination during the five years. The appendix constitutes 12% samples of the overall total histological specimens. This finding is in agreement with other reports, which confirmed that AA is a prevalent disease [1, 2]. Appendix specimen is a frequently received specimen in most histopathology laboratories worldwide [1, 2]. The same reports also suggest that the frequency of occurrence of AA varies widely from region to region with higher numbers of cases seen among the whites than blacks [1, 2]. The standardized incidence rate of appendicitis was 3.85 per 100,000 per annual, which is similar to a literature report from a suburban population of Sagamu, South-west, Nigeria [16].

5.2 PREDISPOSING FACTORS

The frequency of occurrence of AA is increasing in many other African populations. Probably due to urbanization, as reported in Abuja, Nigeria, this is occupied by the individuals from the high socio-economic group in the society [17].

There is high consumption of westernized diet, which consists of low fibers in this region [17]. Globally, the common assertion is that diet rich in fibers tend to increase the bowel motion and consequently reduces the incidence of AA [17]. Therefore in Cameroon, Nigeria, Ghana, and other African, as well as South-East Asian countries where the staple food consists mainly of a diet rich in fiber, the incidence of AA is less [18]. “The male to female ratio of 1:1.5 in this study compares favorably with the studies by Ali *et al.* [19] in Maiduguri and Blair *et al.* [20] in Canada where the male to female ratio was 1:1.2 but in sharp contrasts to other reports in which males predominate” [7,9,16].

5.3 DIAGNOSTIC AND THERAPEUTIC CONSIDERATIONS

The findings in this study concur well with what was obtained in other studies and reinforced the earlier assertion that “the diagnosis of AA is mainly through history and physical examination” [10, 11]. In this series, the mean duration of symptoms is 4.05 days, which compares favorably with other reports both locally and internationally [10, 11]. Twelve patients had perforation at surgery, and two (2) out of these presented primarily in shock. The perforated cases are probably due to late presentation in the emergency room. Other adjudged main reasons for delay presentation in our environment include: “fear of surgical operation and relatively high cost of treatment” [16]. The two patients who came in shock were well resuscitated; also, they had appendectomy subsequently. The average hospital stay post-operation was 5.5 days, with a range of 4–14 days. The hospital stay figures are comparable with other studies [10, 11]. No mortality was recorded in the patients studied. This study showed a wide range of histological diagnosis. The negative appendectomy rate of 4.5% is low compared with most studies reviewed, which reported a range of 8.6–35.8% [9, 10, 21, 24–27]. The low rate of negative appendectomy may not be unconnected with the growing clinical acumen of our surgeons, coupled with radiological investigations. The abdominal pains in these patients were mainly due to pelvic inflammatory diseases and urinary tract infection.

Other authors submitted that “AA constituted 86.9% in this study, which is comparable with the study of Abudu *et al.* [16] in Sagamu, Nigeria. Ojo *et al.* [9] and Abdulkareem *et al.* [10] reported slightly lower rates of 69.9% and 70.3%, respectively. Most studies from outside Nigeria reported a range of 45.7–82.5%, which compared favorably with our study” [11, 24].

5.4 IMMUNOLOGICAL CONSIDERATIONS

For immunological considerations, lymphoid hyperplasia constituted 4.4% in our series, which compares with the study conducted in the United Kingdom by Singhal and Jadhav in 2007 [28] and contrasts sharply to that of Abdulkareem *et al.* [10]. Lymphoid hyperplasia slide is presented in figure 1. Immunological factors, according to some reports, have been suggested to play a pivotal role in the pathogenesis of appendicitis [29, 30]. Barker and colleagues have championed the belief that “appendicitis is a disease that prevails in communities with good public health services and housing in place and, by implication, lower in those without these social indices” [31-34]. The report reinforces the existing evidence in support of the observed low population incidence of appendicitis from developing countries in Asia and Africa [35, 36]. According to existing literature, “with the relative rarity in the first decade and progressive decline after the third decade, it may be inferred that the peak incidence seems to coincide with the age endowed with the most active lymphoreticular activity in the mucosa-associated lymphoid tissues, which make up most of the appendix” [37, 38].

Schistosomal appendicitis constituted 1.0% of the total patients studied, as seen in figure 2. We observed that “the high prevalence of intestinal parasites in the developing world could also account for some cases of appendicitis, as it has been noticed to be initiated by or associated with them. The commonly associated parasites are *Schistosoma mansoni*, *Schistosoma haematobium*, *Enterobius vermicularis*, *Ascaris lumbricoides*, *Entamoeba histolytica*, and pin-worm, among others. Badmus *et al.* [39], and Adebamowo *et al.* [40] have reported some cases of schistosomal appendicitis from southwestern Nigeria.” All these cases were associated with varying degrees of fibrosis in the submucosa. The reports lend credence to the fact that schistosomal appendicitis is associated with inflammation, repair, and deposition of fibro-connective tissue, as well as subsequent obliteration of the appendiceal lumen [20, 41].

5.5 PATHOLOGICAL CONSIDERATIONS

Chronic fibrosing appendicitis was seen in 5.5% of cases in the present study. In contrast, Edino *et al.* [12], in their study, reported 17% of cases of chronic fibrosing appendicitis. Some authors suggested that “the development of appendiceal gangrene and perforation has been invariably linked to the obstruction of the appendiceal lumen; consequently in many cases of early appendicitis, the appendix lumen is patent despite the presence of mucosal inflammation and lymphoid

hyperplasia" [42]. The histology of acute appendicitis is as demonstrated in Figure 3. In the present study, the diagnosis of mucocele was made in 6 (0.9%) of cases. Papaziogas *et al.* [43] also made such an observation in their study spanning over 20 years. The diagnosis of endometriosis was made in just 1 (0.2%) cases in the present study. Gustofson *et al.* [44] studied 133 female patients and found endometriosis to be present in 4 (3%) cases. Only a single instance of Mucinous cystadenoma was diagnosed in the present study accounting for 0.2% of the total cases.

Similarly, Marudanayagam *et al.* [45], in their retrospective analysis of 2660 cases reported mucinous cystadenoma to be present in 0.6% of the cases. A diagnosis of a carcinoid tumor was made in 1 (0.2%) cases, as seen in figure 4. Similarly, Hof *et al.* [46] found carcinoid in only 7(0.47%) cases. Giant cell lymphoma of the appendix was the only malignant lesion encountered in the present study seen in a single case of 55 years old male, thus confirming the view that appendix is mostly involved by benign conditions. No single case of cystadenocarcinoma was seen in our study. This is in sharp contrast to the series by Jones and Paterson [47], who reported that primary malignant tumors of the appendix i.e., cystadenocarcinoma, were found in only 0.1% of all appendectomies. From the foregoing, the research questions have been answered and that the alternative hypothesis holds sway showing in this series that there are significant differences in the clinicopathological lesions of the appendix in the contemporary tropical African population compared with other studies elsewhere.

6. LIMITATIONS OF THE STUDY

1. The retrospective nature of the study is significantly impacted by incomplete record-keeping, which was seen in this series in less than 10% of the total patients managed.
2. There was no Electronic Medical Record System in our hospital until January 2018, which could result in incomplete data.
3. A few patients had delayed presentation, and which could have compounded by the on-going Anglophone- crisis.
4. The other lists of possible limitations of this study may include false beliefs, ignorance, insufficient health infrastructure and poverty in this sub-region of Cameroon.

7. CONCLUSION

The incidence of AA remains low, especially in the rural communities of Africa, as our study has shown. Interestingly, AA constitutes one of the most common surgical conditions, and the significance of uniquely related clinical entities in the diagnosis remains controversial. In our environment, therefore prompt and adequate intervention will go a long way in reducing its morbidity and mortality. Finally, the current study spanned the entire gamut of pathological processes that involve the appendix and provides a fair idea about the clinicopathological correlation in appendectomy specimens.

8. RECOMMENDATIONS

1. We advocate the implementation of Electronic Medical Record System in all our hospitals in the sub-regions for an effective data base system for future research on the disease.
2. There is a need to embark on aggressive public health campaign aimed at improving health care seeking habit of the populace in the sub-region.
3. Health education of the populace to improve on early and prompt diagnosis, adequate resuscitation as well as early surgical intervention in patients with acute appendicitis which invariably will reduce the morbidity and mortality.
4. There is a need to correct the indiscriminate consumptions of herbal remedies, as substitutes for orthodox medicine in our locality.
5. Once the on-going Anglophone crisis is resolved it will positively impact on improvement of existing health infrastructure and health delivery.
6. As advocated by the WHO, any collaboration and integration of the Traditional medicine and Biomedical practices will positively impact on our health delivery system in general.
7. A functional health insurance scheme is mandatory for all citizens.

9. DECLARATIONS

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AVAILABILITY OF DATA AND MATERIALS: All data generated or analyzed during this study are included in this published article.

DISCLOSURES: This Clinical Research is an extract from the first Author- **ABJ's** Doctorate Dissertation

AUTHORS' CONTRIBUTIONS: **ABJ** conceived of the study and participated in its design and coordination as well as helped to draft the manuscript; also read and approved the final manuscript. **ACA** supervised the entire study and participated in its design and coordination as well as helped to draft the manuscript; also read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE: Ethical approval was obtained from the Institutional Ethical Committee. Confidentiality was ensured by not writing the names of patients on proforma in accordance with the Helsinki declaration of 1964. A copy of the written Approval is available for review by the Editor-in-Chief of this journal.

INFORMED CONSENT: Written informed consent was obtained from the patient for publication of this original research and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

COMPETING INTERESTS: The authors declare that they have no competing interests.

CONSENT FOR PUBLICATION: This is a retrospective study and there is no direct human participant. Trial Registration also with Pan African Clinical Trial Registry unique identification number for the registry is PACTR201903475913135. (The article was 'retrospectively registered' with PACTR - South-Africa).

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APPENDIX – A

List of Figures:

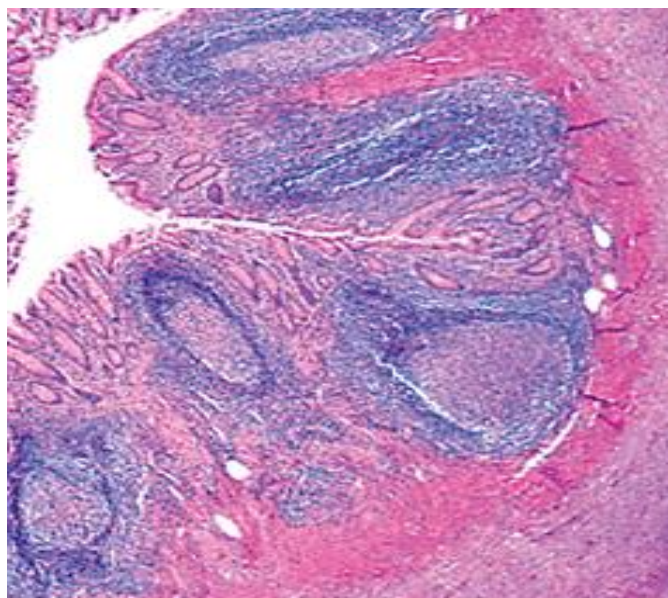


FIGURE 1: APPENDIX SHOWING LYMPHOID NODULES

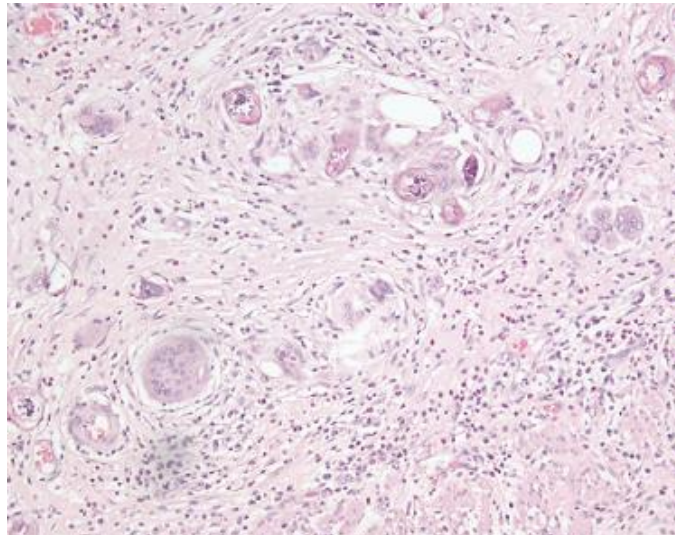


FIGURE 2: SCHISTOSOMAL APPENDICITIS

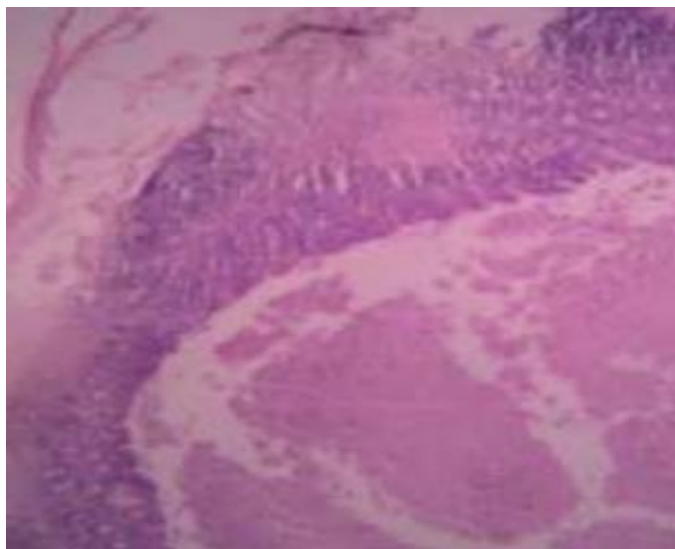


FIGURE 3: ACUTE APPENDICITIS

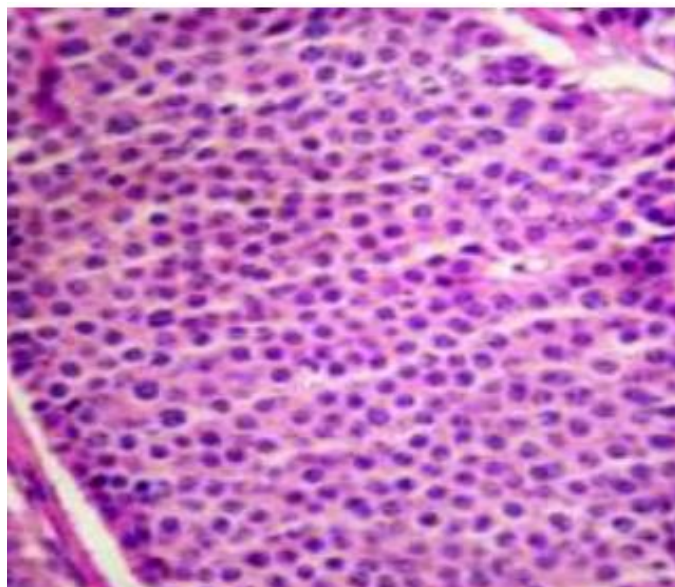


FIGURE 4: CARCINOID APPENDIX

List of Tables:

TABLE 1: DISTRIBUTION OF CASES ACCORDING TO AGE GROUPS & SEX

AGE GROUP (YEARS)	MALE	FEMALE	SUBTOTAL	PERCENTAGE %
0-9	13	10	23	3.4
10-19	72	130	202	29.5
20-29	78	148	226	33.1
30-39	51	57	108	15.8
40-49	29	42	71	10.4
50-59	24	17	41	6.0
>60	6	6	12	1.8
TOTAL	273	410	683	100

TABLE 2: DISTRIBUTION OF CASES ACCORDING TO HISTOLOGICAL DIAGNOSIS

HISTOLOGICAL DIAGNOSIS	NO OF CASES (N=683)	PERCENTAGE %
Acute appendicitis	410	60
Lymphoid hyperplasia	30	4.4
Eosinophilic appendicitis	7	1.0
Subacute appendicitis	13	1.9
Normal	31	4.5
Appendicitis with peritonitis	137	20.1
Submucosal fibrosis	38	5.6
Endometriosis	1	0.15
Mucocele	6	0.9
Schistosomiasis	7	1.0
Carcinoid tumor	1	0.15
Mucinous cystadenoma	1	0.15
Giant cell lymphoma	1	0.15
Total	683	100

TABLE 3: DISTRIBUTION OF THE APPENDECTOMY SPECIMENS AS PER THEIR NATURE

SPECIMEN	NO OF CASES (N= 683)	% PERCENTAGE
NON-NEOPLASTIC	680	99.5
NEOPLASTIC	3	0.5
TOTAL	683	100