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Appendicectomy Specimens in Bayelsa State, Nigeria. An 8 Year Clinicopathological Analysis of 539 Cases

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Abstract: *Acute Appendicitis (A.A) Is The Most Common Cause Of Acute Abdomen And Appendiceal Tissues Are One Of The Most Common Specimens Received By The Histopathologist For Evaluation. The Diagnosis Of A.A Is Mainly Clinical With Right Iliac Fossa Pain As The Most Consistent Symptom. Routine Imaging With Ultrasound And Computerized Tomography Are Advocated To Further Increase The Diagnostic Yield But These Are Not Readily Available In Our Environment. Despite All These, Negative Appendicetomies Confirmed On Histopathological Examination Still Occur Especially In Young Females. Unusual Appendiceal Pathologies Have Also Been Reported. We Present A Clinicopathological Review Of 539 Cases Of Suspected A.A. Seen In Bayelsa State, Nigeria Over 8years With The Aim To Highlight The Age And Sex Relationship, Negative Appendectomy Rate, Perforation Rate And The Incidence Of Other Uncommon Appendiceal Pathologies. The Study Revealed 248 Males And 291 Females With Male To Female Ratio Of 1:1.2. The Age Range Was 9months To 79years With The 21 – 30 Age Group Having The Peak Incidence. The Negative Appendectomy Rate (Nar) Was 16% And The Perforation Rate Was 4%. Nineteen (19) Of The 29 Patients With Normal Histology Were Women, 16 Of Them Being Of Childbearing Age. Two Cases Each Of Schistosomiasis And Endometriosis Were Seen. A Reasonable Nar And Perforation Rate Are Feasible With Reliance On Clinical Acumen. Routine Histopathological Examination Is Advocated For All Appendix Specimens Removed For Suspected A.A.*

Keywords*: Acute Appendicitis, Histopathological Examination, Negative Appendicectomy, Perforation Rate*

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I. Introduction

Acute Appendicitis Is The Most Common Cause Of Acute Abdomen.[1] By Extension Appendicectomy Is One Of The Most Common Surgical Procedures Performed By The General Surgeon. Specimens Of The Vermiform Appendix Are One Of The Most Commonly Examined Tissues By The Histopathologist.[2,3] Duduyemi In 2014 Reported That Appendicectomy Specimens Constituted 10% Of All Specimens Examined.[4]

An Individual Has A Lifetime Risk For Appendicitis Of 6%. It Is Mainly A Disease Of The Young With 90% Of Cases Occurring In Individuals Below 40years Of Age.[5] The Diagnosis Of Acute Appendicitis Remains Largely Clinical With Right Iliac Fossa (Rif) Pain As The Most Common Feature. The Accuracy Of The Diagnosis Has Been Increased By The Use Of Scoring Systems Notable Among Which Is The Alvarado Scoring System.[6] Imaging Modalities Like Ultrasound Scan And Computerized Tomography Scan Have Further Improved The Diagnostic Yield Of Acute Appendicitis.[7,8] However, Their Availability And Affordability Remains A Predicament In A Developing Country Like Ours. The Surgeon Has Another Chance Of Buttressing This Diagnosis At The Time Of Surgery Where He Sees And Feels The Appendix First Hand And Makes An Intraoperative Impression.

Despite All These, The Occurrence Of Negative Appendicectomy I.E. Appendicectomy Performed With The Presumptive Diagnosis Of Acute Appendicitis Which Turned Out Negative On Histopathological Examination, Is Not Uncommon. The Unnecessary Operation As It Turns Out Has Implications In Terms Of Hospital Costs And Loss Of Man Hours At Work As Well As Exposing The Patient To The Possible Array Of Complications That Can Result From Abdominal Surgery In General And Appendicectomy In Particular Including Anaesthetic Complications. The Most Implicated Subset Of Individuals For Negative Appendicectomy Are Females Of Childbearing Age.[9,10,11] There Is Obvious Need To Carry Out Routine Histopathological Examination Of Appendicectomy Specimens In These Individuals As A Negative Histology Warrants A Search For Other Extra Appendiceal Differential Diagnoses As The Cause Of The Patients' Symptoms If This Had Not Already Been Picked Up On Preoperative Investigations And Or Laparoscopy Where Available.

On The Other Hand, The Diagnosis Of A.A In Males Is Relatively More Straight Forward With A Corresponding Lower Negative Appendicectomy Rate.[9] The Question Then Is; Is Routine Histopathological Examination Of Appendicectomy Specimens Necessary In These Patients Especially In Resource Poor Settings Like Ours?

It Should Also Be Borne In Mind Though That The Finding Of Other Appendiceal Pathologies Is Not Uncommon In Appendicectomy Specimens Removed For Presumed Appendicitis. Such Pathologies Include Schistosomasis,[12,13] Endometriosis,[14] Carcinoid Tumour,[15] And Adenocarcinoma.[16] Others Include Granulomatous Conditions Like Tuberculosis, Amoebiasis And Worms Like E. Vermicularis, Trichuris Trichuria, Ascariasis And Taenia Saginata.[17]

There Is A Paucity Of Studies That Have Addressed The Issues Above In Our Local Environment Thus The Need For This Study.

II. Aims And Objectives

The Aim Of Our Study Is To Determine The Clinicopathological Characteristics Of Patients Whose Appendices Were Sent For Histopathological Evaluation Following Appendicectomy For Presumed Acute Appendicitis.

The Specific Objectives Are To Determine:

1. The Age And Sex Analysis Of Patients With Acute Appendicitis (A.A).
2. The Negative Appendicectomy Rate (Nar).
3. The Incidence Of Other Appendiceal Pathologies In Specimens Removed For A.A.
4. The Perforation Rate.
5. The Relationship Between Length Of The Excised Appendix And Aa.

III. Methodology

This Study Is A Multicenter Retrospective Study Involving The Niger Delta University Teaching Hospital, Okolobiri, The Federal Medical Center, Yenagoa As Well As A Foremost Private Histopathology Center All In Bayelsa State, South-South Nigeria.

All Specimens Of The Vermiform Appendix Removed For Presumed A.A From 2009 To 2016 Were Included. The Case Files And Histopathology Reports Were Retrieved And Analyzed. Tissue Blocks Were Retrieved Where Necessary To Cut New Sections For Review. Those Excluded Include Patients Who Had Interval Or Elective Appendicectomy For Recurrent Appendicitis And Those In Whom The Appendix Was Part Of A Surgical Specimen E.G. Right Hemicolectomy. Variables Analyzed Were Age, Sex, Clinical Features, Preoperative Diagnosis, Length Of Excised Appendix And Histopathological Diagnosis.

A Diagnosis Of A.A Was Made With The Presence Of The Neutrophils In The Muscularis Propria Of The Appendiceal Wall (Positive Specimen). A Specimen Was Taken As Negative If The Appendix Was Histologically Normal Or Contained Other Appendiceal Pathology Without Infiltration Of The Muscularis Propria By Neutrophils. The Results Were Analyzed Using Simple Statistical Methods.

IV. Results

A Total Of 539 Appendix Specimens Were Received During This Period. There Were 248 Males And 291 Females With A M:F Ratio Of 1:1.2. The Age Range Was From 9 Months To 79 Years. The Age Group With The Highest Appendicectomy Rate Was The 21 To 30 Year Group Accounting For 33.4% Of All Cases. 86.3% Of All The Patients Were Below 40years Of Age.

Table 1: Age – Frequency Distribution

Range	Frequency	Percentage Frequency
1 – 10	33	6.1%
11 – 20	133	24.7%
21 – 30	180	33.4%
31 – 40	119	22.1%
41 – 50	48	8.9%
51 – 60	13	2.4%
61 – 70	10	1.9%
71 – 80	3	0.5%
Total	539	100%

The Histopathological Diagnoses Included A.A (N=425), Submucosal Fibrosis (N=31), No Histologic Diagnosis Or Normal Appendix (N=29), Appendiceal Schistosomiasis (N=2), Appendiceal Endometriosis (N=2), Periappendicitis (N=7), Perforated Appendicitis (N=17) And Lymphoid Hyperplasia (N=26).

The Negative Appendicectomy Rate (Nar) Was 16%. Submucosal Fibrosis, Normal Appendix And Lymphoid Hyperplasia Were Considered As Negative For Appendicitis. Of The 29 Patients Who Had Normal Appendices On Histopathological Examination, 19 Were Females And 10 Were Males With A Male To Female Ratio Of 1.9:1. Sixteen (16) Of The Females (84.2%) Who Had A Normal Histology Were Within Child Bearing Age (16 To 40 Years).

Table 2: Negative Appendectomy Rates (Nar) In Various Studies

Author(S)	Location	Year	Nar
*Udoye And Koroye	Bayelsa, Nigeria	2018	16%
Emre Et Al	Istanbul, Turkey	2013	6%
Jat Et Al	Pakistan	2015	3%
Guller Et Al	Berne, Switzerland	2011	6.4%
Khairy Et Al	Saudi Arabia	2009	9.2%
Espinoza Et Al	Chile	1998	12.2%
Osime And Ajayi	Benin, Nigeria	2005	16.1%
Chamisa	Durban, South Africa	2009	17%
Memisoglu Et Al	Istanbul, Turkey	2010	17.3%
Ma Et Al	Hong Kong	2010	18.2%
Jones Et Al	United Kingdom	2007	23%
Hussain Et Al	United Kingdom	2009	26.5%
Monajemzadeh Et Al	Tehran, Iran	2011	35.9%

The Perforation Rate In Our Study Was 4%. Of The 17 Patients Who Had Perforated Appendicitis, 9 Were Males And 7 Females. 35.3% Of All Perforations Occurred In The 21–30 Year Age Group. The Average Length Of Specimens With Confirmed Appendicitis Was 7.6cm As Against 6.8cm For The Normal Appendices. There Were 4 Unusual Appendiceal Pathologies (0.7%). Two (2) Were Appendiceal Schistosomiasis And Another Two (2) Appendiceal Endometriosis.

Table 3: Perforation Rates In Various Studies

Author(S)	Location	Year	Perforation Rate
*Udoye And Koroye	Bayelsa, Nigeria	2018	4%
Jat Et Al	Pakistan	2015	2%
Okobia And Njoku	Benin, Nigeria	2006	4.4%
Dey Et Al	India	2010	4.3%
Emre Et Al	Istanbul, Turkey	2013	12.6%
Monajemzadeh Et Al	Tehran, Iran	2011	13.8%
Guller Et Al	Switzerland	2011	16.5%
Ma Et Al	Hong Kong	2010	17.6%
Edino Et Al	Kano, Nigeria	2004	23%
Chamisa	Durban	2009	34%
Agboola Et Al	Ilorin, Nigeria	2014	40.4%

V. Discussion

The Male To Female Ratio In Our Study Was 1:1.2. Similarly Designed Studies Have Shown A Male To Female Ratios Of 1:1.3 And 1.4:1.[4,18] Osime Et Al Working In Benin, Nigeria Reported The Highest Incidence Of Aa In The 2nd Decade Of Life Accounting For 49% Followed By The Third Decade With 15%.[9] In Another Similar Study, 62% Of Patients With Appendicitis Were Below 30 Years Of Age.[15] Chamisa Et Al Also Found That 45% Of Patients Were In The 2nd Decade Of Life.[17] In Separate Studies The Average Ages Of Patients With Appendicitis Ranged From 18.8 Years To 38years.[19,20,21] The Above Findings Prove That Appendicitis Is A Disease Of The Young Which Is Consistent With Our Own Findings In Which 86.3% (Table 1) Of All Patients Were Below 40 Years Of Age With The Modal Age Range Being 20 – 30years. The Problems In The Management Of Suspected A.A Are The Finding Of A Normal Non Inflamed Appendix Or Progression To Perforation With Its Established Sequelae Like Abscess, Mass And Generalized Peritonitis. These Are Thought To Occur When The Threshold For Surgery Is Too Low And Too High Respectively.

The Negative Appendicectomy Rate (Nar) In Various Studies Ranges From 3% To 35.9% (Table 2).[15,18,22,23,24,9,17,25,21,20,19,26] It Should Be Pointed Out That Emre Et Al Who Reported A Nar Of 6% Excluded Paediatric Patients In Their Study.[15] The Age Range Was 17 – 85years.[15] This May Have Accounted For Their Low Nar. On The Other Hand, Monajemzadeh Et Al Working In Iran On Exclusively Paediatric Patients With Age Range 10months To 15years Reported A High Nar Of 35.9%.[26] In Our Study The Nar Was 16%

Which Is Within The Acceptable Limits In The Literature. This Rate Would Be Lower If We Had Excluded Lymphoid Hyperplasia And Submucosal Fibrosis Which We Considered As Negative Appendicectomy Specimens. Studies Have Shown That Females Of Childbearing Age Are More Likely To Have A Negative Appendicectomy.[7,9,17,21,22] This Is Similar To Findings In Our Study. This Is Because In This Subgroup Of Patients, There Are A Variety Of Extra Appendiceal Pathologies Which Mimic A.A Which Do Not Affect Males And Females Outside Childbearing Age. These Differentials Include Ectopic Pregnancy, Torsion Or Rupture Of An Ovarian Cyst, Pelvic Inflammatory Disease. Preoperative Imaging With Ultrasound And Computerized Tomography (Ct) Scan And Laparoscopy Have Been Shown To Reduce The Nar.[7,8,27] In A Study By Wallace Et Al On The Influence On Imaging On The Nar In Pregnant Women, He Retrospectively Divided 86 Pregnant Women Into 3 Groups; Those Who Had Clinical Evaluation Alone, Those Who Ultrasound Only And Those Who Had Both Ultrasound And Ct. There Was A Significantly Lower Nar In The Ultrasound Plus Ct Compared To The Other 2 Groups.[28] Some Other Authors Have Reported Preoperative Imaging To Be Of No Benefit In Reducing The Nar.[21] In One Of The Earliest Studies In Our Region On The Effect Of Laparoscopy On The Nar, Ogbonna Et Al In 1993 Reported A Reduction Of The Nar From 47% To 10% In Females And From 29.7% To 11% In Males.[8] Borgestein Pj Et Around The Same Period Showed A Difference In Nar In Women Who Did Underwent Laparoscopy (5%) And Those Who Did Not (38%).[27]

In Our Practice Which Is In A Semi-Urban Setting, We Do Not Routinely Carry Out Preoperative Imaging For All Our Patients And Indeed More Complex Modalities Like Ct Scan Are Not Readily Available And Affordable But We Still Had An Acceptable Nar. We Rely Mainly On Our Clinical Acumen. In Equivocal Cases Especially In Women Within The Childbearing Age Bracket, We Request For An Abdominopelvic Ultrasound Scan And Request For A Gynaecological Review. Only One Of Our Patients Had A Laparoscopic Appendicectomy As We Just Acquired The Equipment. We Do However Acknowledge The Role Of Laparoscopy In A Young Female With Suspected Acute Appendicitis.

In Our Study We Recorded A Perforation Rate Of 4%. This Is Rather Low When Compared To Rates In Other Studies Which Range From 2% To 40.4% (Table 3).[18,29,30,15,26,22,21,31,17,32] Agboola Et Al Ilorin Attributed The High Perforation Rate Of 40% To Delay In Presentation As A Result Of Poverty And Illiteracy Where Patients Initially Sought Relief With Drugs Bought Over The Counter Or Self Medication.[32] Temple And Co In Alberta, Canada In 1995 Studied The Relationship Between In-Hospital Delay To Surgery, Onset/Duration Of Symptoms And The Incidence Of Perforated Appendicitis. The Perforation Rate And Nar In Their Study Were 16% And 14% Respectively. They Concluded That Delayed Presentation Led To Perforation.[33] Velanovic And Satava In 1992 Concluded There Was An Inverse Relationship Between The Surgeons Mis-Diagnosis (Normal Appendicectomy Or Negative Appendicectomy) Rate And The Perforation Rate.[34] They Observed There Was A Reduction In The Complications From Acute Appendicitis When The Perforation Rate Reduced But It Meant An Increase In The Nar. Both Rates Balanced Out At About 10%.[34] They Propounded That Both Rates Be Considered When Assessing The Quality Of Surgical Care Delivered To A Population.[34] The Inverse Relationship Between Perforation Rate And Nar In The Theory Propounded In Their Conclusion Appears To Be In Play In Our Study With A Perforation Rate Of 4% And A Nar Of 16% But It Seems To Be Flawed In The Study By Ayub Jat Et Al In Saudi Arabia Who Recorded A Pr Of 2% And A Nar Of Just 3%.[14]

Several Studies Have Revealed Several Uncommon Appencidiceal Pathologies. These Include Intestinal Parasites Like Schistosomasis,[4,12,17,20] Trichuris Trichuria,[17] Oxyuris Oxyuria,[26] Ascaris,[17] Enterobius Vermicularis.[15,17,20] Chronic Granulomatous Conditions Have Also Been Reported In Various Studies And They Include Tuberculosis,[17,26] And Ameobiasis.[17] Endometroisis Of The Appendix Has Been Seen By A Number Of Authors.[14,15,17,20] Also In The Literature As Uncommon Appendiceal Pathologies In Appendicectomy Specimens Are Tumors Like Polyps, Carcinoid Tumours,[15,20,21,26] Mucocele,[4,15] Mucinous Cystadenoma,[20,21] And Adenocarcinoma.[16,20,21] Inflammatory Bowel Disease Has Also Been Reported As An Uncommon Appendiceal Finding.[20] Others Include Diverticulitis,[15,21] Eosinophilic Infiltration,[4,15] Submucosal Fibrosis[4,15,21] And Lymphoid Hyperplasia.[4]

In Our Study There Were 2 Cases Each Of Appendiceal Schistosomiasis And Endometriosis. Duduyemi In Abuja And Chamisa In Durban Both In Africa Reported Cases Of Appendiceal Schistosomiasis.[4,17] This Is Most Likely A Function Of The Relative Prevalence Of The Disease In This Part Of The World.

Tuberculosis Of The Appendix Was Reported By Chamisa In Durban, South Africa And By Maryam Monajamzadeh Working In Children In Tehran, Iran.[17,26] These May Reflect The Overall State Of Health Care And By Extension, The State Of The Economy In These Areas.

Jones In The United Kingdom Reported 23 Cases Of Benign Tumours (Carcinoid, Cystadenoma And Polyps) And 3 Cases Of Carcinoma Of The Appendix Amongst 1225 Appendicectomy Specimen Examined.[20]

It Is Worth Noting That In Our Study We Did Not Record Any Appendiceal Tumour Either Benign Or Malignant. Other Similar Studies In Africa Did Not Reveal Any Appendiceal Tumor Either.[4,17] The Rarity Of

Benign And Malignant Tumours In Our Region Is Likely Due To The Relatively Low Incidence Of Colorectal Cancer In Our Climes. This Is Due To The Relatively Younger Age Of Our Population, Our High Fibre Diet, And A Low Incidence Of Premalignant Conditions Like Adenomas And Inflammatory Bowel Disease.

Ayab Jat Et Al In Saudi Arabia Conducted A Study Similar To Ours In Which There Was No Unusual Histologic Finding In 480 Appendix Specimens Examined.[18]

Of The 2 Cases Each Of Schistosomiasis And Endometriosis In The Index Study, None Were Suspected Preoperatively Or Intraoperatively. Jones Et Al Reported A Suspicion Rate Of 2 Out Of 46 Uncommon Pathologies. Both Were Carcinoids Out Of A Total Of 13.[20] Connor Et Al In Their Study Reported That Less Than 50% Of Appendiceal Tumours Are Identified Intraoperatively.[35] In Another Study By Dean Et Al, It Was Shown That Pathologies Which Required Additional Evaluation Or Treatment Were Missed At The Time Of Operation In 10 Out Of 13 Patients.[36] These Authors Have Advocated Routine Histopathological Examination Of All Appendicectomy Specimen And We Tend To Agree With Them.

The Average Length Of The Appendices In Our Study Was 7.6cm And 6.8cm For Confirmed Appendicitis And Normal Appendices Respectively. There Is A Paucity Of Studies On The Relationship Between The Length Of The Appendix And The Occurrence Of Appendicitis.

VI. Conclusion

Appendicitis Is A Disease Of The Young. Negative Appendicectomy Is Commoner In Females Of Child Bearing Age. An Acceptable Nar And Perforation Rate Is Feasible Without Advanced Imaging As The Diagnosis Of A.A. Remains Largely Clinical. Unusual Appendiceal Pathologies Do Occur**.** Routine Histopathological Examination Of Every Appendectomy Tissue Is A Dependable Practice For Complete Surgical Management Of Suspected Acute Appendicitis Even In An Environment Like Ours With Scarce Resources. Clinicians And Pathologists Are Encouraged To Uphold This Practice Even In The Hinterlands To Ensure The Best Outcome For Every Case Of Suspected Appendicitis.

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