

*Full Length Research Paper*

# **Anatomical variations of Appendix in Patients with Acute Appendicitis among two major tribes in Lagos Nigeria**

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**Background:** Acute appendicitis is a common surgical problem. Prompt and accurate diagnosis is essential for appropriate management. This relies not only on the understanding of the clinical features, but also on the knowledge of the variations in its anatomical position.

**Patients and methods:** In the present study, we have examined the position, length, and the extent of the mesoappendix of the vermiform appendix in patients seen in three private hospitals in Lagos state over a period of twelve calendar months. The features of interest were evaluated during appendicectomy. The variations in the anatomic features of appendix was compared between the two dominant tribes in Lagos Nigeria

**Results:** The pelvic appendix was commonest position (41.3%). The average length of the appendix was 11.5cm and the mesoappendix fail to reach the tip in 55%.

There were subtle anatomical variations of appendix between the two major tribes in patients that presented with acute appendicitis in three private hospitals in Lagos state. Appendix was 0.5cm longer in the Ibos; the incidence of appendicitis appeared relatively lower in Ibos. The position of the appendix in the Yoruba was mainly pelvic, while in the Ibo the pelvic and retrocaecal position occur in equal proportions.

The extent of mesentery did not appear to have any influence on the incidence of acute appendicitis.

**Conclusion:** There are no dramatic differences in the position and length of the vermiform appendix in the two major tribes in Lagos. The incidence of appendicitis was higher in the Yoruba's probably because more Yoruba's were seen and secondly because Lagos is the home of the Yoruba's. Furthermore pelvic appendix was common in the Yoruba and as speculated may account for this difference.

**Key Words:** Appendicitis, vermiform appendix, position, length and variations among 2 ethnic groups.

## **INTRODUCTION**

The vermiform appendix is a caecal diverticulum which appears in the sixth week of embryonic life as a swelling on the anti-mesenteric border of the mid-gut loop. The position and length are attained by rapid helicoidal differential growth of the lateral and anterior position of the caecum with displacement of the appendix posteriorly and medially (Sadler. 1990). It is located in the right lower

quadrant of the abdomen (Williams et al., 1995; Sabiston et al., 2001), appearing as a narrow worm like tube arising from the postero-medial aspect of the caecal wall 2cm or less below the end of the ileum (Williams et al., 1995. Zinner et al 1997).

In a previous study, it was observed that the length and position of the appendix in Nigerians did not show a significant variation from the Caucasian population. In this study, the length of the appendix was given as ranging from 4cm to 20cm (Solanke, 1970). In another study, it was given as a range of 1.5cm to 30cm (Badoe 1994).

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The appendix is subject to considerable variation in position but data on the variations in its position in Nigerians is limited (Ahmed et al., 2007). As the ascending colon elongates, the appendix may acquire a paracaecal or retrocaecal position. On the other hand, it may descend over the pelvic brim as a pelvic appendix. Most investigators have reported that the commonest position for the appendix is the retrocaecal position and ranges of 45% to 74% have been quoted (Varshney et al., 1996; Moore 2003).

Few studies have however shown a higher incidence of pelvic appendix ranging from 33.3% to 43.6% (Katzurski et al., 1979; Golalipour et al., 2003; Ahmed et al., 2007).

The position of the base of the appendix is essentially constant being located at the confluence of the caecal taenia coli deep to the Mc-burneys point (Al-fallouji 1993). The difference in appendiceal position influence clinical presentation of acute appendicitis and may occasionally presents as a diagnostic nightmare to the clinician (Varshney et al., 1996).

The appendix is connected by a short meso-appendix to the lower part of ileal mesentery. This fold is usually triangular, extending almost to the appendicular tip (Williams et al., 1995). The extent of this mesentery varies considerably with age and sex. Failure of meso-appendix to reach the tip reduces vascularization of the tip of the organ predisposing it to gangrene and early perforation during inflammation (Zinner et al., 1997). The mesoappendix has a free border which carries blood supply to the organ by the appendicular artery a branch from the ileo-colic artery (Schwartz 1999).

The appendix has a narrow lumen which is lined with colonic epithelium. It has lymphoid follicles in the submucous layer at birth that proliferates to peak at the age of 17 to 20 years coinciding with the peak incidence age of acute appendicitis (Schwartz 1999). The narrow lumen of the appendix makes it prone to obstruction by faecolith, intestinal helminths or foreign body resulting in inflammation.

Acute appendicitis is the most common cause of emergency abdominal surgery. (Treutner KH, Schumpehick V 1997). A variation in anatomical position causes different clinical manifestations which can mimic other disease conditions like pelvic inflammatory disease (Birnbaum 2000).

Furthermore, the frequency, severity and complications of acute appendicitis are related to the anatomic features of the vermiform appendix (Bakheit and Warille 1999). The incidence of acute appendicitis is influenced by diet, race, social status, age and sex (Dock 1982; Morris et al., 1987). The aim of the present study is to investigate certain anatomical features of the vermiform appendix such as the position, the length, the extent of meso-appendix, the presence of faecolith and the circumference with regards to the age and sex in two major Nigerian tribes (Ibo/Yoruba) in Lagos.

## MATERIAL, PATIENTS AND METHOD

A total of 80 consecutive patients presenting with acute appendicitis in three private hospitals in Lagos were evaluated over a period of 12 months from January to December 2007. The patients were of all age groups and sexes among the two major tribes. They were 38 females and 42 males. 35 people were of the Ibos tribe while 45 were Yoruba's. A clinical diagnosis of acute appendicitis was the only inclusion criteria. Assessment and surgical treatment for all patients were carried out by the same surgeon.

During surgery careful observations were made of the position of the appendix and the presence of faecolith. The extent of the mesentery was noted to determine whether it extends to the tip, the proximal half, 1/3<sup>rd</sup> or 2/3 of the appendix. Measurements of the length and the circumference of the appendix were made using stout chromic catgut from the base to tip before the eventual removal of the appendix. The findings were entered into a proforma that contains the patient record including, Name, age, sex, tribe, position of the appendix, the length in centimeters, the extent of the mesentery, the circumference and the presence or absence of faecolith. The position was determined by careful inspection as well as following the direction of the appendix with a finger before the caecum was delivered into the wound. Data were analyzed with Epi-Fo 6. Chi square was used to compare the categorical variables and p value < 0.05 set as statistical significance

## RESULTS

This study shows that the highest incidence of acute appendicitis occurs between the ages of 21- 30years in both tribes (36.25%). Acute appendicitis is most prevalent in age range of 11- 40years accounting for 83.75% in this study. Table 1

The percentages of different positions of appendix were as follows: Pelvic 41.3%; Retrocaecal 23.8%, postileal 17.5% Subcaecal 12.5% Preileal 5%. Table 2

The male to female distribution shows that they were 42 males and 38 female giving M: F ratio of almost 1:1 and the distribution shows that they were 45 Yoruba's and 35 Ibos.

When the different positions were compared between the sexes and the two major tribes, there were variation in the position of appendix between males and females and between the Ibos and Yorubas. Table 3 and Table 4. Retrocaecal is higher in males than females (13 versus 6) while pelvic appendix slightly more common in females (19 versus 14) Table 4

The most common anatomical position of appendix was pelvic in Yorubas 51% while retrocaecal and pelvic occur in equal proportions in the Ibos 28.5%. Table 3

- The average length of appendix in this study was 11.5cm (SD =0.58) and STANDARD ERROR =0.065. The length varies between 6cm to 20cm. The appendix is on the average 0.4cm longer in males than females. It is 11.9cm in males whereas in females it is 11.5cm.

- The average length of Appendix in Ibos was 0.5cm longer than the Yoruba's. Average length of appendix in Yoruba's was 11.4cm while in the Ibos it

**Table 1:** Shows the age Distribution of the Patients with Acute Appendicitis in Lagos.

AGE	FREQUENCY	PERCENTAGE
1 – 10	5	6.25%
11 – 20	16	20%
21 - 30	29	36.25%
31-40	22	27.5%
41 – 50	4	5%
51 – 60	2	2.5%
61 – 70	1	1.25%
71 - 80	1	1.25%
TOTAL	80	100%

**TABLE 2 :** Showing Position of Appendix

POSITION	FREQUENCY	PERCENTAGE
RETROCAECAL	19	23.7%
SUBCAECAL	10	12.5%
PELVIC	33	41.3%
POST IEAL	14	17.5%
PREILEAL	4	5.0%
TOTAL	80	100%

**Table 3:** Showing Positions of Appendix in two tribes Ibos and Yorubas

TRIBE	RETROCAECAL	SUBCAECAL	PELVIC	POST ILEAL	PRE ILEAL
IBO	10	5	10	7	3
YORUBA	9	5	23	7	1
TOTAL	19	10	33	14	4

**Table 4:** Sex Distribution of the Position of Appendix

SEX	RETROCAECAL	SUBCAECAL	PELVIC	POST- ILEAL	PRE- ILEAL
MALE	13	5	14	7	3
FEMALE	6	5	19	7	1
TOTAL	19	10	33	14	4

was 11.9cm.

- The circumference ranges from 0.5cm to 1cm in both tribes. There was no statistical difference  $p=0.28$
- Faecoliths occur in (8 out of 80) 10% of all cases

of acute appendicitis in this study. There was however more faecoliths in the Yoruba Tribe 5(6.3%) compared to 3(3.7%) in the Ibos.

- In 45% of the patients in this study the

**Table 5:** Showing the Extent of Mesoappendix in Lagos

EXTENT OF MESOAPPENDIX	FREQUENCY	PERCENTAGE
1. PROXIMAL 1/3RD	9	11.25%
2. PROXIMAL 1/2	7	8.75
3. PROXIMAL 2/3	28	35.0%
4. FULL LENGTH	36	45.0%
TTOTAL	80	100%

**Table 6:** Showing the Extent of Mesoappendix in the two tribes (Ibo and Yoruba)

EXTENT OF MESENTERY	IBO	YORUBA
1. PROXIMAL 1/3RD	5	4
2. PROXIMAL 1/2	3	3
3. PROXIMAL 2/3	14	14
4. FULL LENGTH	12	20
TTOTAL	34	45

One patients of the Ibo tribe had no clear cut extent of mesentery recorded and hence was excluded.

mesoappendix extended to its full length whereas in 55% of patients it failed to reach the tip. Table 5.

- The mesoappendix reach the tip in 20 out of 45 (44.4%) patients of Yoruba origin but only in 12 out of 34 (35.2%) in Ibos . Table 6

## DISCUSSION

The position of the appendix is of great interest not only because of its evolutionary significance (Balthazar and Gade 1976) but also because of its pathological and surgical importance. The position of the appendix is important in the pathogenesis, presentation, surgical approach and prognosis of the disease (Ojeifo et al 1989).

In this study, the incidence of pelvic position of appendix was highest accounting for 41.3% of cases studied. This result is similar to other studies in Zambia Katzurski et al (1979) in which the pelvic position was commonest 43%, Gosalipour et al (2003) in which the pelvic position was 33.3% and (Ahmed et al, 2007) in which 51.2% of pelvic appendix was observed at elective laparoscopy..

But in other studies the retrocaecal position was the commonest position Bakheit and Warille (1999), Ajmani and Ajmani (1983), Solanke (1970), Wakely 1932, In all

these studies the retrocaecal position varies from 32.5% to 65%)

Solanke (1970) in Ibadan found 38%; Ojeifo et al 1989 in Lagos found 30.2%.in 101 patients that underwent appendectomy. Ojeifo and colleagues study 447 autopsies and cadavers and found that retrocaecal appendix was (59.39%). It is also pertinent to note that studies which showed the higher percentage of retrocaecal appendix are studies done on cadavers while studies done on live subjects revealed a higher incidence of pelvic appendix.. It therefore appears to be true according to Varshney et al (1996) that the retrocaecal appendix appears to be less prone to infection. Nevertheless, the authors believing that the retrocaecally placed appendix is more prone to infection because of kinking, fixation or compression of its vascular supply have failed to recognize the primary pathological events in the majority of patients with acute appendicitis which is luminal obstruction (Bowers 1939, Wangesteen and Dennis 1939 Pieper et al 1982).

From studies in live subject which consistently show a higher incidence of Pelvic appendicitis and the primary pathology which is luminal obstruction, it will be logical to say the pelvic position makes it more prone to inflammation as a result of obstruction by the caecal content due to its dependent position thereby initiating the onset of inflammation.

The adult appendix is a long diverticulum averaging 10cm in length and approximately 3cm below the ileocaecal valve (Buschard and Kjaerldfarrd 1973). This study shows the average length of 11.5cm. The average length is longer than 9.6cm in Solanke studies of 1970. However the range of 6cm to 20cm is similar to his of 4cm to 20cm. The normal vermiform appendix varies from 5-35cm with average of 8cm

The appendix was 0.4cm longer in males than females this is similar to other studies by Monks (1902) and Charles (1991) and Schwartz (1999). The average length of the appendix was relatively longer in the Ibo than the Yoruba. It was an average 0.5cm longer in the Ibo than Yoruba. The reason for this is not obvious but appendix length is known to varies between races, It is observed to be longer in the Negro than the Caucasians. (Dock 1982). Furthermore it is believed that the length of appendix is developmentally proportional to the growth and length of the foetus as a whole De Garis (1941). Demographic differences in the two tribes may be responsible.

The incidence of acute appendicitis is said to be equal in both sexes. In this study the ratio of male to female is almost 1:1 However acute appendicitis appears to be slightly more common in Yoruba than the Ibo. This may be partly due to either the greater population of Yoruba's in Lagos or as a result of dietary factors. The incidence of appendicitis is highest in communities that consume more cereals and less vegetables and fruits (Morris et al, 1986). The diet of the Yoruba's is Amala refine carbohydrates flour while the stable food of the Ibos is Garri, a high roughage meal. Both stable diets are eaten with different soups while Amala goes with ewedu mainly fluid contents Garri is often eaten with vegetables.

Again the frequency of pelvic appendix is higher in the Yoruba than the Ibos. From the forgoing discussion that the pelvic appendix is more prone to infection, this may also explain the slight preponderance of acute appendicitis in Yoruba compared to the Ibo.

Furthermore, the incidence of faecolith as a cause of acute appendicitis in this study showed 10%. This is comparable to other studies that found a range of 11-52%. (Nitecki et al, 1990, Jones, 1988, Shans, 1994). The frequency of faecolith also varies between the two ethnic groups being higher in the Yoruba compared to the Ibo. Diet may also partly explain this finding. The Ibo's diet is rich in vegetables while the Yoruba tends to have a highly refined carbohydrate diet.

In 55% of cases the mesoappendix failed to reach the tip which was similar compared with 46.6% in Sudan (Bakheit and Warille). The incidence is increased in children 0-18 years occurring as high as 75%. There is a variation in the extend of the mesoappendix in the two tribes. The mesoappendix reach the tip in 44.4% of Yoruba but only in 35% in the Ibo. This does not seem to have any significant influence on the incidence of acute

appendicitis in both tribes. Hence the Yoruba with higher incidence have more full length of mesoappendix. Failure of mesoappendix to reach the tip of the organ is said to make it prone to inflammation.

Average circumference of appendix was (0.5-1cm) is similar to figures quoted in the literature and there seems to be no tribal differences.

## CONCLUSION

This study determined the position of the appendix; pelvic appendix was highest 41.3% and the average length was 11.5cm which seems to have been different from earlier reports of a retrocaecal appendix being more common and average length of 9.6cm. It also showed anatomical differences between the two major tribes in Nigeria. The subtle differences in the length, position and extent of mesoappendix between the major tribes may explain why the incidence of acute appendicitis varies between race, social class and communities as reported in the literature.

The most common position of the appendix in other parts Nigeria also need more investigation, as there are conflicting reports between autopsy and live subjects.

This study will in future be expanded to include a multicenter evaluation of the common positions of appendix in Nigerians.

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