*International Journal of Anatomy and Research,*
*Int J Anat Res 2018, Vol 6(1.1):4815-18. ISSN 2321-4287*
*DOI: https://dx.doi.org/10.16965/ijar.2017.473*

**Original Research Article**

# ANATOMICAL VARIATIONS OF VERMIFORM APPENDIX IN GUJARAT

**Chaudhari ML*[1], Kanani S [2].**

*[1] Assistant professor in Department of Anatomy, Dr Mk Shah Medical Collage Chandkeda, Ahmedabad, India.

[2] Assistant Professor in GMRES Medical collage, Himatnagar, India.

## ABSTRACT

**Background**: Head of appendix can be placed in different situations but the base of appendix is connected to the cecum. The variation in the situations is classified into six locations: retrocecal, pelvic, subcecal, paraileal, retroileal, and subhepatic.

**Objectives:** To study the variation in the anatomical features, length & external diameter of appendix and its association with age and sex in people in the Gujarat.

**Material and method**: This study was conducted on total 200 cases taken from dissection laboratory of the anatomy department of three different medical college of Ahmedabad during 2009 to 2012. Length of vermiform appendix was measured by nylon thread from root to tip of appendix. Thread's length was measured by vernier caliper. External diameter was measured by vernier caliper at a maximum external diameter of the appendix.

**Result:** anatomical locations of the appendix which were as follows: retrocecal in 111 individuals (55.5%), pelvic in 47 individuals (23.5%), retroileal in 18 individuals (9.0%), subcaecal in 13 individuals (6.5%), paracaecal in 10 individual (5.0%), and subhepatic in 1 individual (0.5%). a significant association was found between the appendix length and different age groups. The average length of appendix was 55 mm for men and 51 mm for women. The average external diameter of appendix was 73 mm for men and 65 mm for women.

**Conclusion:**Retrocaecal appendix has symptoms of upper urinary tract infection, due to irritation of the adjacent ureter. In pelvic position pain may be felt when the thigh is flexed and medially rotated, because the obturator internus is stretched. Pelvic appendix may irritate the bladder or rectum causing suprapubic pain, pain with urination, or feeling the need to defecate.

**KEY WORDS:** Appendicitis, Mesoappendix, Retrocaecal appendix. Vermiform appendix.

**Address for Correspondence:** Dr. Manisha Laxmanbhai Chaudhari, Dr Mk Shah Medical Collage Chandkeda, Ahmedabad, Gujarat, India. **E-Mail:** drmanishachaudhari6@gmail.com

| Access this Article online | Journal Information |
|---|---|
| Quick Response code | **International Journal of Anatomy and Research** |
| | ICV for 2016 90.30 |
| | ISSN (E) 2321-4287 \| ISSN (P) 2321-8967 |
| | **https://www.ijmhr.org/ijar.htm** |
| | **DOI-Prefix:** https://dx.doi.org/10.16965/ijar |
| **DOI:** 10.16965/ijar.2017.473 | **Article Information** |
| | Received: 13 Oct 2017 \| Accepted: 18 Nov 2017 |
| | Peer Review: 14 Oct 2017 \| Published (O): 05 Jan 2018 |
| | Revised: None \| Published (P): 05 Jan 2018 |



## INTRODUCTION

This study was conducted on total 200 cases taken from dissection laboratory of the anatomy department of three different medical college of Ahmedabad during 2009 to 2012 after ethical permission from Institutional Ethical Permission (IEC) with an age range of 50-90 years of both sexes. The cadavers were embalmed through the carotid and femoral arterial perfusion of formaldehyde solution, spirit, water and glycerine and preserved in a weak formalin solution before dissection.

**Method of Measurement:** Length of vermiform appendix was measured by nylon thread from root to tip of appendix. Thread's length was measured by vernier caliper. External diameter was measured by vernier caliper at a maximum external diameter of the appendix. Dissection

done according to cunningham's manual of practical anatomy.

Vermiform appendix is an element of the digestive tract which lies in right lower quadrant of abdomen which has a worm-like structure and emerge during embryological life from the posteromedial wall of the cecum, about 2 cm below the ileocecal valve [1]. Though a remarkably constant structure in man, the appendix is nevertheless occasionally subject to the extremes of variation, that is, total suppression and duplicity. Its length varies from 2 to 20 cm,in average 9 cm [2]. Head of appendix can be placed in different situations but the base of appendix is connected to the cecum. The variation in the situations is classified into six locations: retrocecal, pelvic, subcecal, paraileal, retroileal, and subhepatic [3-5].

The appendix contains lymph follicles. Lymphoid tissue first emerges in the appendix about 2 weeks after birth [6]. It's epithelial lining has a surface coat of immunoglobulins which may be involved in the control of lymphatic surveillance [7,8]. The appendix develops from the midgut loop together with the caecum, ascending colon and the proximal two thirds of the transverse colon [9,10]. Appendicitis is the main reason of acute abdomen in young people [6]. Identification of the normal position of appendix is important because in appendicitis variable positions may produce symptoms and signs related to their position, and hence can mimic other diseases [11].

This study was conducted to study the variation in the anatomical features, length & external diameter of appendix and its association with age and sex in people in the Gujarat, India.

## RESULTS

**Table 1:** Age and gender distribution of studied people (N=200).

| Age | Gender | | Total |
|---|---|---|---|
| | Male | Female | |
| <10 | 9 (4.5) | 2 (1.0) | 11 (5.5) |
| 11-19 | 7 (3.5) | 3 (1.5) | 10 (5.0) |
| 20-39 | 63 (31.5) | 23 (11.5) | 86 (43.0) |
| 40-59 | 27 (13.5) | 14 (7.0) | 41 (20.5) |
| >60 | 30 (15.0) | 22 (11.0) | 52 (26.0) |
| Total | 136 (68.0) | 64 (32.0) | 200 (100.0) |

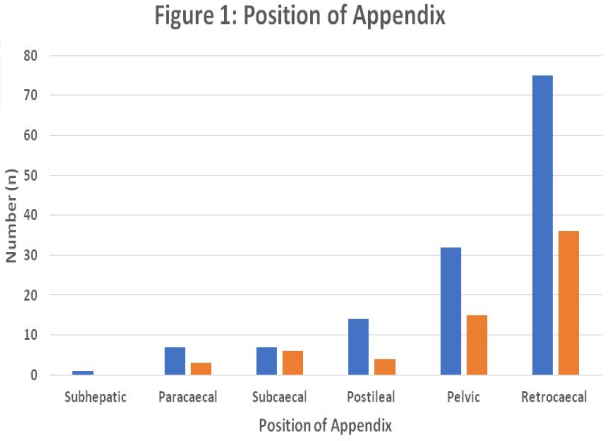
Table 1 shows that present study included 68.0% male and 32.0% female cadaver. Highest number of cadaver belonged to age group pf 20 to 39 years followed by more than 60 & 40 to 59 years respectively. The mean age of the study population was 38.7 years.

Table 2 and figure 1 shows anatomical locations of the appendix which were as follows: retrocecal in 111 individuals (55.5%), pelvic in 47 individuals (23.5%), retroileal in 18 individuals (9.0%), subcaecal in 13 individuals (6.5%), paracaecal in 10 individual (5.0%), and subhepatic in 1 individual (0.5%).

**Table 2:** Distribution of studied people according to gender and position of appendix (N=200).

| Position of appendix | Gender | | Total |
|---|---|---|---|
| | Male | Female | |
| Subhepatic | 1 (0.5) | 0 (0.0) | 1 (0.5) |
| Paracaecal | 7 (3.5) | 3 (1.5) | 10 (5.0) |
| Subcaecal | 7 (3.5) | 6 (3.0) | 13 (6.5) |
| Retroileal | 14 (7.0) | 4 (2.0) | 18 (9.0) |
| Pelvic | 32 (16.0) | 15 (7.5) | 47 (23.5) |
| Retrocaecal | 75 (37.5) | 36 (18.0) | 111 (55.5) |
| Total | 136 (68.0) | 64 (32.0) | 200 (100.0) |

**Fig. 1:** Distribution of studied people according to gender and position of appendix (N=200).




The most common anatomical location was retrocaecal location for both sexes. Pelvic, Subcecal, retroileal, paracaecal, and subhepatic locations were in the following places in both sexes, respectively. No anatomical position of the subhepatic was observed in female population.

The minimum length of appendix was 20 millimeters and its maximum length was 90 millimeters in male and in female, it was 24 & 70 millimeters respectively. The average length

of appendix was 55 mm for men and 51 mm for women. The minimum external diameter of appendix was 30 millimeters and its maximum length was 150 millimeters in male and in female, it was 40 & 140 millimeters respectively. The average external diameter of appendix was 73 mm for men and 65 mm for women.

**Table 3:** Association between length of appendix and age among studied people (N=200)

| Age (in years) | Length of Appendix (in mm) (%) | | | | | P value* |
|---|---|---|---|---|---|---|
| | <40 | 40-79 | 80-119 | >119 | Total | |
| <10 | 1 (0.5) | 7 (3.5) | 1 (0.5) | 2 (1.0) | 11 (5.5) | 0.001 |
| 11-19 | 1 (0.5) | 5 (2.5) | 3 (1.5) | 1 (0.5) | 10 (5.0) | |
| 20-39 | 0 (0.0) | 33 (16.5) | 47 (23.5) | 6 (3.0) | 86 (43.0) | |
| 40-59 | 2 (1.0) | 8 (4.0) | 26 (13.0) | 5 (2.5) | 41 (20.5) | |
| >60 | 0 (0.0) | 15 (7.5) | 22 (11.0) | 15 (7.5) | 52 (26.0) | |
| Total | 4 (2.0) | 68 (34.0) | 99 (49.5) | 29 (14.5) | 200 | |

*- Chi-square test

In this study, a significant association was found between the appendix length and different age groups (p value < 0.001). The details are shown in Table 3. The highest length of appendix was seen in people 20 to 39 years old. Incomplete mesoappendix was mostly seen in the age group below 10 years. Mesoappendix was complete in 148 (74.0%) of the studied sample.

## DISCUSSION

The ultimate position of the appendix is profoundly influenced by the changes in the position and shape which the caecum undergoes during development and growth. The primordium of cecum and vermiform appendix i.e. caecal diverticulum appears in the 6th week as a swelling on the antimesentric border of the caudal limb of the midgut loop. After the completion of the gut rotation, the caecal diverticulum occupies a position on the right side of the abdominal cavity [9].

In our study, mean age of individual was 38.7 years which comparable with the similar study done by Ghorbani A et al [12]. In present study, the most common position of appendix was retrocaecaland the lowest was subhepatic position. This finding is correlate with the similar study done by L. Ajmani et al. in India [13], Ojeifo et al. in Bosnia [14], Solanki TF et al. in India [15], Cecil PG et al [16], Shah MA et al [17], Bailey L et al [18] and Clegg-Lamptey et al. in Ghana [19]. This finding is not compared with the similar study done by Katzurski MM et al [20], OjeifoJO et al [21], Rahman MM et al [22], and Paul UK et al. [23] where they have reported that the most common position of appendix is pelvic. Variable positions of vermiform appendix may have an effect on the diagnosis of appendicitis, which is one of the most common causes of acute abdomen [24].

Present study found mean lower length of appendix in comparison of other similar study done by Ferguson et al [25], Lewis et al [26], Arthur R et al [27], Royster et al [28] and Donald C et al. [29].

## CONCLUSION

Appendix is the only organ in our body which has not constant anatomical position. Various positions of vermiform appendix are useful to understand the location of site of occurrence of pain during appendicitis. Retrocaecal appendix has symptoms of upper urinary tract infection, due to irritation of the adjacent ureter. In pelvic position pain may be felt when the thigh is flexed and medially rotated, because the obturator internus is stretched. Pelvic appendix may irritate the bladder or rectum causing suprapubic pain, pain with urination, or feeling the need to defecate. Postileal position in some males, can irritate the ureter and cause testicular pain. In sub-hepatic position, the patient have pain in the right hypochondriac region. From various positions of vermiform appendix we can understand the possible outcome of the appendicitis specifically location of site of pain. Appendix is supplied by end artery which is one of cause of occurrence of appendicitis. Appendicular artery which is branch of inferior division of iliocolic artery goes through appendix along mesoappendix.

**Conflicts of Interests:** **None**

## REFERENCES

[1]. S. Standing, h. Ellis, j. C. Healy, d. Johnson, a. Williams, and p.Collins, “gray’s anatomy,” in alimentary system, pp. 1189–1190, churchilllivingstone, NEW YORK, USA, 39th edition, 2005.

[2]. I. B. Singh, human anatomy, regional and applied, vol. 2, cbcpublishers and distributors, new delhi, india, 3rd edition, 1999.

[3]. S. J. Schwartz, g. T. Shires, f. C. Spencer, j. M. Daly, j. E. Fischer,and a. C. Galloway, “principles of surgery schwartz,” in thappendix, pp. 1383–1385, mcgraw-hill, philadelphia, pa, usa, 7th edition, 1999.

[4]. D. C. Sabiston and m. Courtney, sabiston's textbook of surgery:th biological basis of modern surgical practice in appendix, vol. 2, wbsaunders, philadelphia, pa, usa, 16th edition, 2001.
[5]. P. L. Williams, l. H. Bannister, m. M. Berry, p. Collins, m.Dyson, and j. E. Dussek, "gray's anatomy," in alimentary system, pp. 1775–1776, churchillli vingstone, new york, ny,usa, 39th edition, 2005.
[6]. Schwartz, s.j. shires, g.t., spencer, f.c., daly, j.m. ,fischer, j.e., galloway, a,c.: principles of surgery schwartz. In: the appendix 7th edn; vol 3. Mc grawhill. Philadelphia. 1999:1383 – 5.
[7]. Williams, p.l.; bannister l.h., berry m.m., collins, p., dyson,m., dussek, j.e. and ferguson, m.w.j.: gray's anatomy. In: alimentary system. 38th edn. Churchill livingstone, New York.1995:1775-6.
[8]. Williams, r. A. And glimourh.m. : gastrointestinal andesophageal pathology. In: the appendix. First edn; Churchill livingstone. Edinburg. 1989:533-8.
[9]. Moore kl and persaud t v n. Before we are bornessentials of embryology and birth defects. 5th edition. Philadelphia: w. B.saunderscompany; 1998:273-280.
[10]. Sabiston, d. C., townsend, courtney, m. :sabiston's textbook of surgery, the biological basis of modern surgical practice. In : appendix. 16th edn; vol 2; w.b. saunderscompany. Philadelphia. 2001:918.
[11]. Sadler, t.w.: langman's medical embryology. 7th edn; williams and wilkins. Baltimor. 1990:260-2.
[12]. Ghorbani a, forouzesh m, kazemifar am. Variation in anatomical position of vermiformappendix among iranian population: an old issue whichhas not lost its importance. Anatomy research international. 2014. Available from: http://dx.doi.org/10.1155/2014/313575.
[13]. M. L. Ajmani and k. Ajmani. The position, length and arterial supply of vermiform appendix. Anatomi scheranzeiger, 1983;153(4):369–374.
[14]. J. O. Ojeifo, a. B. Ejiwunmi, and j. Iklaki. The position of the vermiform appendix in nigerians with a review of the literature. west African journal of medicine. 1989;8(3):198–204.
[15]. Solanketf. The position, length, and content of the vermiform appendix in nigerians. Brit. J. Surg. 1970;57:100-10.
[16]. Cecil p.gwakeley. The position of the vermiform appendix tip obtained by analysis of 10,000 cases. Journal anat. 1933;67:277.
[17]. Shah ma, shah m. The position of vermiform appendix. Ind med gaz. 1945;80:494-95.
[18]. Baily & love practice of surgery, 24edition, chapter 70.the vermiform appendix. 2004;1205-07.
[19]. J. N. A. Clegg-lamptey, h. Armah, s. B. Naaeder, and n.A. Adu-aryee. Position and susceptibility to inflmmation ofvermiform appendix in accra, Ghana. East African medicaljournal. 2006;83(12): 670–678.
[20]. M. M. Katzarski, UK Gopal Rao, K. Brady, Blood supplyand position of the vermiform appendix in Zambians. Medicaljournal of Zambia, 1979;13(2):32–34.
[21]. J. O. Ojeifo, a. B. Ejiwunmi, and j. Iklaki. The position ofthe vermiform appendix in Nigerians with a review of theliterature. West African journal of medicine. 1989;8(3)198–204.
[22]. M. M. Rahman, m. Khalil, h. Rahman, s. Mannan, s. Z.Sultana, and s. Ahmed. Anatomical positions of vermiformappendix in Bangladeshi people. Journal of Bangladesh societyof physiologist. 2006;1:5–9.
[23]. U. K. Paul, H Naushaba, T. Begum, JAlam. Position of vermiform appendix: a postmortem study. Bangladesh journalof anatomy. 2009;7(1):34–36.
[24]. H. Turkoglu, MROnur, AK. Poyraz, E Kocakoc, Evaluation of normal appendix vermiformis in adults with multidetector computed tomography. Clinical imaging. 2012;36(6):758–762.
[25]. Ferguson, john. Some important points regarding the appendix vermiformis. Am. Jour. Med. Sc. 1891;26:61-62.
[26]. Lewis wh. Anatomy of the human body, twentieth edition. Philadelphia: lea and febiger; 1918.
[27]. Arthur robinson. Cunningham's textbook of anatomy, fifth edition. Edinburgh: william wood and co; 1923.
[28]. Royster ha. Appendicitis. New york: appleton and co.; 1927. 20.
[29]. Donald c. Collins. The length and position of the vermiform appendix - a study of 4,680 specimens. Ann surg. 1932;96(6): 1044–48.

**How to cite this article**:

Chaudhari ML, Kanani S. ANATOMICAL VARIATIONS OF VERMIFORM APPENDIX IN GUJARAT. Int J Anat Res 2018;6(1.1):4815-4818. **DOI:** 10.16965/ijar.2017.473