ISSN: 2581 – 3633
PubMed - National Library of Medicine - ID: 101745081

International Journal of Medical Science and Advanced Clinical Research (IJMACR)

Available Online at:www.ijmacr.com

Volume – 8, Issue – 4, August - 2025, Page No.: 195 – 199

Age and Gender Wise Variations of Coccygeal Anatomy – A Cross Sectional Record Based Study in A Tertiary Care Hospital

[1]Dr Akshitha B J, [2]Dr Rajesh Raman, [3]Dr Devika C

[1-3]Department of Radiology, Mandya Institute of Medical Sciences, Mandya

Corresponding Author: Dr Akshitha B J, Department of Radiology, Mandya Institute of Medical Sciences, Mandya.

How to citation this article: Dr Akshitha B J, Dr Rajesh Raman, Dr Devika C, "Age and Gender Wise Variations of Coccygeal Anatomy – A Cross Sectional Record Based Study in A Tertiary Care Hospital", IJMACR- August - 2025, Volume – 8, Issue - 4, P. No. 195 – 199.

Open Access Article: © 2025 Dr Akshitha B J, et al. This is an open access journal and article distributed under the terms of the creative common's attribution license (http://creativecommons.org/licenses/by/4.0). Which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Background: The coccyx, or tailbone, is the terminal segment of the vertebral column and demonstrates significant anatomical variations. These variations can influence clinical conditions such as coccydynia. They may also be confused with coccygeal fractures. There is sparse normative data on the anatomical variations of coccyx in Indian population. This study is aimed at the evaluation of age and gender-wise anatomical variations of coccygeal anatomy using computed tomography (CT) scans.

Objectives: To describe the coccygeal anatomy across different age groups and genders, classify the types of coccyx and determine the number of coccygeal segments in South Indian population.

Methods: A cross-sectional, record-based study was conducted over four months (June–September 2024) at the Department of Radiology of our institute. Institutional ethical committee clearance was obtained for the study. A total of 500 CT scans of the abdomen and pelvis (from patients aged 18–85 years) were retrospectively reviewed. Patients with coccygeal trauma or neoplastic lesions were excluded. The number and type of coccygeal segments were assessed and categorized. Age and sex wise distribution of the coccygeal types was tabulated. Statistical analyses were performed using SPSS version 22 software.

Results: Of the 500 patients included, 281 were males (56.2%) and were 219 females (43.8%). The age group ranged between 18-85 years, with a mean age of 45.63 years. Most number of CT studies were found in the age group of 41–50 years. Type II coccyx was the most prevalent morphology (50.2%), followed by Type I (27.4%). Four coccygeal segments were observed in 89.2% of cases. These anatomical configurations were consistent across genders but showed some age-related trends.

Conclusion: This study highlights the predominance of Type II coccyx and the four-segment configuration in South Indian population. The findings differ from several international studies which report Type I as the most common. The results underscore the importance of region-specific anatomical reference data for accurate diagnosis and management of coccygeal disorders, particularly coccydynia and coccygeal fractures.

Keywords: Coccydynia, CT Scans, Human Coccyx

Introduction

Human coccyx consists of terminal vertebral segments of human spine and is variably composed of three to five individual segments or vertebrae.[1] Since the human coccyx is considered a vestigial remnant of a tail, it is also referred to as the tailbone. The word coccyx is derived from the Greek word for cuckoo, as this portion of the spine resembles a cuckoo's beak. It acts as a weight bearing structure and also provides positional support to anus by acting as the site of insertion of pelvic floor tendons.[5] Various studies have examined the anatomical variability and clinical significance of coccygeal morphology, particularly its role in conditions like coccydynia and traumatic injuries.[2] Coccyx was classified into 4 types by Postacchini and Massobrio and subsequently modified by Nathan et al into 6 types.[9]

Imaging the coccyx and its surrounding tissues presents a unique challenge to the radiologist because of the complex and variable regional anatomy. In addition, familiarity with coccyx region anatomy is essential when performing procedures such as image-guided biopsy and diagnostic or therapeutic analgesic injections.[9] Coccydynia refers to pain localized to the coccygeal region, without associated lower back pain or radiation/referral of pain. The condition affects individuals in all age groups. However, the pain onset typically starts in the fourth decade, with a higher prevalence in women. Normal reference data on morphology of coccyx are essential to interpret changes in coccygeal anatomy and the evaluation of idiopathic coccydynia.[9,10] There is sparse data available on the nature of coccygeal anatomy in Indian poplulation. The study throws light on age and sex wise anatomical distribution of various types of coccyx in South Indian population.

Objectives

- To describe age-wise variation in the coccygeal anatomy.
- To describe gender-wise variation in the coccygeal anatomy.
- To describe different types of coccyx.
- To determine the proportion of number of coccygeal segments in various age groups.

Methodology

This cross-sectional record based study was conducted over 4 months period (June 2024 to September 2024) at the Department of Radiology, MIMS, Mandya. Institutional Ethical committee clearance was obtained prior to data collection. The study population included individuals who underwent CT scans of the lower abdomen for indications other than coccydynia in the Department of Radiology during the study period. The sample size was determined based on a previous study using the formula $n = Z_{1-\alpha/2}^2 \times p \times q / l^2$, where $Z_{1-\alpha/2}$ was 1.96 for a 95% confidence level, *p* was 64% (based on the most common type of coccyx reported in earlier literature), and *q* was 36%. According to this calculation, a minimum of 384 subjects was required for the study. However, a total of 500 cases was included to enhance the reliability of the findings. The sampling method used was consecutive sampling.

©2025, IJMACR

Inclusion criteria comprised patients of both sexes aged between 18 and 85 years who had undergone either plain / Contrast-Enhanced Computed Tomography of the abdomen & pelvis or CT scan of the KUB (Kidneys, Ureters, and Bladder) region. Patients with coccygeal fractures or neoplastic lesions of the coccyx were excluded from the study. A retrospective review of 500 abdominal CT scans was performed to evaluate the type of coccyx and the number of coccygeal segments. Dataset meeting the inclusion criteria was evaluated, tabulated and analyzed using Microsoft Excel and SPSS version 22 (trial version). Descriptive statistics such as percentages were used for categorical data, including types of coccyx, while continuous variables like age and number of coccygeal segments were expressed as mean and standard deviation. Inferential statistical analyses were conducted using the independent t-test to compare means and the Chi-square test to evaluate associations between categorical variables and to identify variations in coccygeal anatomy.

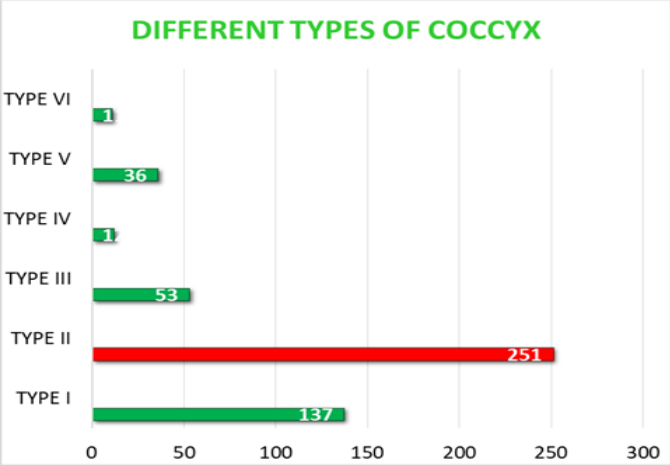
Observations and Results

Demographic Data

The study included a total of 500 patients, with 281 males (56.2%) and 219 females (43.8%). The age range of the participants was 18 to 85 years, with a mean age of 45.63 years. The most common age group among the subjects was 41–50 years, indicating a higher representation of middle-aged individuals in the sample, which reflects the population more often undergoing the CT scans of the abdomen and KUB.

The most prevalent coccyx type was Type II, found in 50.2% of subjects (Graph 1), followed by Type I, seen in 27.4%. Regarding segmentation, four coccygeal segments were observed in 89.2% of the subjects, making it the dominant anatomical pattern. The distribution of coccyx types and segment numbers was consistent across genders but showed age-wise variation, particularly with the prominence of Type II in the 41–50 age group. These findings highlight the anatomical diversity of the coccyx and suggest that variations such as Type II coccyx (Fig.1) and the presence of four segments (Graph 2) are the most prevalent patterns in this South Indian population.

Graph 1: Different types of coccyx: In our study, Type II (50.2%) and Type I(27.4%) coccyx were most common.



Graph 2: Number of coccygeal segments: Four coccygeal segments was present in 89.2% of the subjects.

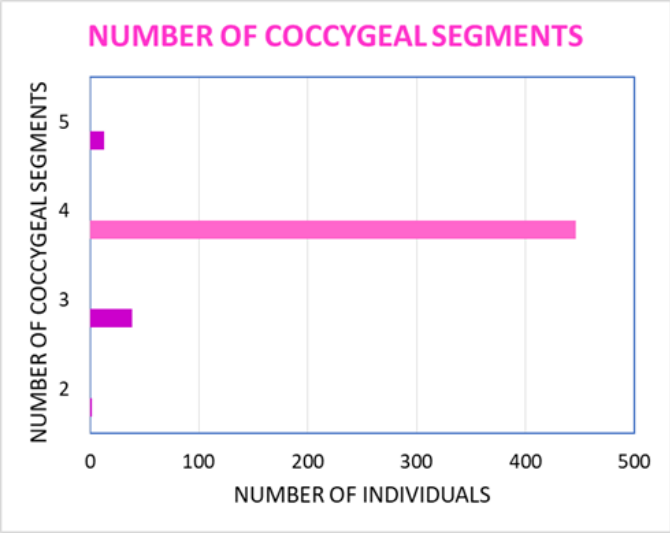
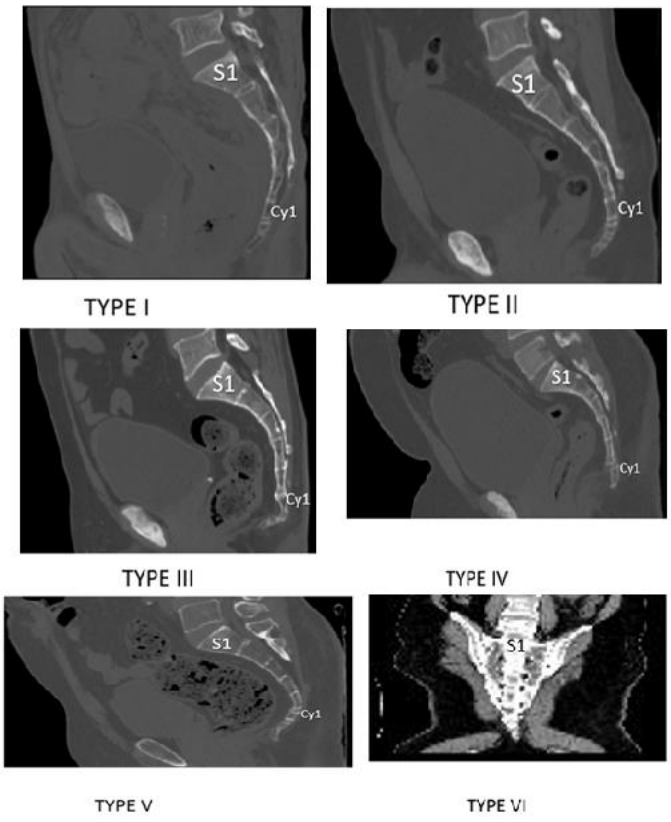


Figure 1: Different morphological types of coccyx.



Discussion

The present study provides a comprehensive overview of coccygeal anatomy and its variations with age and gender. The findings revealed that Type II coccyx was the most common morphology (50.2%), followed by Type I (27.4%), and that four coccygeal segments were present in 89.2% of subjects. These results differ from several previous studies done globally. Woon et al. (2013) and Maigne et al. (2000) reported Type I as the most frequent coccygeal morphology in Western populations.[1,2] Similarly, studies by Marwan et al. (2014) and Yoon et al. (2016) in Arab and Korean populations respectively also found Type I to be predominant.[3,4] In contrast, Indiran et al. (2017), who studied an Indian cohort using multislice CT, observed a more varied distribution, though with a higher prevalence of Type I.[5] This variation may reflect ethnic, genetic, or environmental influences. Furthermore, studies like that of Postacchini and Massobrio (1983) and Nathan et al. emphasized that anterior angulation (as seen in Type II) may predispose individuals to coccydynia.[6,7] Our finding that four coccygeal segments were most common is in line with the study of Jason et al., who noted this configuration in 76% of their sample.[8]

Skalski et al. (2020) highlighted the significance of coccygeal anatomy in imaging and diagnosing coccygeal trauma and coccydynia [9], while Sousa Correia et al. (2019), Gurses (2014), and Nalini et al. (2018) have shown that precise knowledge of coccygeal structure is essential for effective pain management through ganglion impar blocks[10,11,12.] Other studies, such as those by Gunduz et al. (2015) and Usmani et al. (2018), demonstrated that targeted treatments like pulsed radiofrequency and neurolysis depend heavily on anatomical understanding for optimal outcomes.[13,14] Another study by Turchan et al. emphasizes the therapeutic importance of precise anatomical localization of the coccyx and ganglion impar in managing chronic pelvic and perineal pain, further supporting the relevance of anatomical studies[15]. The type –III and type –VI variant may be confused with fracture as they show anterior and lateral angulations. Knowledge of various types of coccyx is important in differentiating fracture from anatomical variants.

Conclusion

This study provides insight into the anatomical variations of the coccyx in a South Indian population using CT imaging. The most common coccyx type observed was Type II**,** followed by Type I**,** and the majority of individuals (89.2%) had four coccygeal segments**.** These findings differ from earlier international studies where Type I was reported as the predominant morphology, highlighting the role of ethnic and regional

©2025, IJMACR

differences in coccygeal anatomy. The lack of sufficient normative data on coccygeal morphology in Indian literature emphasizes the need for population-specific studies to better understand variations and support accurate diagnosis and effective management of conditions such as idiopathic coccydynia, coccygeal fractures and pain syndromes of this region. This study serves as a reference for radiologists and clinicians and reinforces the importance of recognizing anatomical diversity during imaging and interventional procedures involving the coccygeal region.

References

1. Woon JT, Perumal V, Maigne JY, Stringer MD. CT morphology and morphometry of the normal adult coccyx. Eur Spine J. 2013;22(4):863–870.
2. Maigne JY, Doursounian L, Chatellier G. Causes and mechanisms of common coccydynia: role of body mass index and coccygeal trauma. Spine (Phila Pa 1976). 2000;25(23):3072–3079.
3. Marwan YA, Al-Saeed O, Husain J, et al. Morphology and morphometry of the coccyx in an Arab population. Clin Anat. 2014;27(5):688–693.
4. Yoon SW, Song SJ, Roh SW, et al. Analysis of sacrococcygeal morphology and its relevance to coccydynia. J Korean Neurosurg Soc. 2016;59(6): 579–584.
5. Indiran V, Sivakumar V, Maduraimuthu P. Coccygeal morphology on multislice computed tomography in a tertiary hospital in India. Asian Spine J. 2017;11(5):694–699.
6. Postacchini F, Massobrio M. Idiopathic coccygodynia. Acta Orthop Scand. 1983;54(2):215–219.
7. Nathan H, Weizenbluth M, Halpern GJ. Variations of the coccyx: anatomy and clinical significance. J Bone Joint Surg Am. 1963; 45:107–113.
8. Jason M, Lee YP, Choi YK. Anatomic configuration and variability of the coccyx. Clin Anat. 2015; 28(4):526–533.
9. Skalski MR, Matcuk GR, Patel DB, et al. Imaging coccygeal trauma and coccydynia. Radiographics. 2020;40(4):1090–1106.
10. Sousa Correia J, Silva M, Castro C, et al. The efficacy of the ganglion impar block in perineal and pelvic cancer pain. Support Care Cancer. 2019;27(11):4327–4330.
11. Gurses C. Management of oncologic perineal pain with impar ganglion radiofrequency application: case report. Pain Physician. 2014;17(1):E135–E138.
12. Nalini KB, Murthy JMK. Transcoccygeal neurolytic ganglion impar block for perineal pain in advanced cancer: case series. Indian J Palliat Care. 2018;24 (1):103–105.
13. Gunduz OH, Kenis-Coskun O, Kolsuz ME, et al. Comparison of conventional and pulsed radio frequency denervation in coccygodynia. Clin J Pain. 2015;31(4):303–307.
14. Usmani H, Rizvi M, Ahmad I, et al. Pulsed radiofrequency treatment of the ganglion impar in chronic perineal pain. Pain Med. 2018;19(3):599–605.
15. Turchan A, Kopacz Ł, Wójcik B, et al. Combination of neurolysis drugs and radiofrequency thermocoagulation of the ganglion impar for treatment of chronic pelvic and perineal pain. Videosurgery Miniinv. 2018;13(3):410–416.

©2025, IJMACR