Estimation of size of sella turcica using computed tomography in patients visiting a tertiary care center in Kaski district

Nawaraj Paudel[1]*, Pujan Sharma[1], Keshab Sharma[1], Santwana Parajuli[1], Krishna Timilsina[1], Kismat Gurung[1]

[1]Department of Radiology, Gandaki Medical College Teaching Hospital and Research Center, Pokhara, Nepal

ABSTRACT

Introduction: Sella turcica is a saddle-shaped depression in the body of the sphenoid bone. The deformity in sella turcica size indicates an abnormality within the cranium. Thus, the objective of the study was to estimate the normal size of sella turcica in Nepalese population using computed tomography and to determine whether its' size varies with age and sex. **Methods:** A cross-sectional analytical study was conducted among 250 patients visiting Department of Radiology, Gandaki Medical College from April 11 to July 12, 2024. The patients advised for computed tomography of head were enrolled in the study. The demographic data and sizes (length, anteroposterior diameter and depth) of sella turcica were recorded. Univariate analysis including frequencies and percentage for demographic data and size of sella turcica were calculated. ANOVA test was used to determine the association between size of sella turcica with age groups. Independent t-test was used to determine association of size of sella turcica with gender where p-value <0.05 was considered statistically significant. **Results:** The mean length, antero-posterior diameter and depth of sella turcica was found to be 10.94±6.90 mm, 12.42±2.26 mm and 7.99±1.49 mm respectively. There was statistically significant increase in length and anteroposterior diameter of sella turcica with age ($p<0.05$). All the dimensions of sella turcica were highest for males which was not significant. **Conclusions:** The mean length, antero-posterior and depth of sella turcica was 10.94 mm, 12.42 mm, and 7.99 mm respectively. Furthermore, the length and antero-posterior diameter of sella turcica increased with age while all dimensions of sella turcica didn't vary with respect to gender.

Keywords: Computed tomography, sella turcica, sizes.

***Correspondence:**
Dr. Nawaraj Paudel
Department of Radiology
Gandaki Medical College Teaching Hospital and Research Center, Pokhara, Nepal
Email: nawarajpaudel5@gmail.com
ORCID iD: https://orcid.org/0000-0002-0384-5151

Submitted: August 22, 2025
Accepted: November 12, 2025

To cite: Paudel N, Sharma P, Sharma K, Parajuli S, Timilsina K, Gurung K. Estimation of size of sella turcica using computed tomography in patients visiting a tertiary care center in Kaski district. JGMC-Nepal. 2025;18(2):140-4.

DOI: 10.3126/jgmc-n.v18i2.83529

INTRODUCTION

The sella turcica, also known as hypophyseal fossa, is a saddle-shaped depression in the body of the sphenoid bone in the human skull that houses the pituitary gland.[1] Anatomically, it is located in the sphenoid bone behind the chiasmatic groove and the tuberculum sellae situated within the middle cranial fossa.[2] The image of the sella turcica, on a cephalometric landmark in the skull.[3]

The anatomic variation of the sella turcica has been classified as: round, oval and flat.[4] Any abnormality of the pituitary gland, to the disturbance in regulation of secretion of glandular hormones could manifest from an altered shape of sella turcica.[5] Also, a deviation from the normal size and shape of the sella turcica due to its malformation may be implicated in an undetected underlying disease and it can be an indication of a pathological condition of the gland.[6,7] Various conditions including Down's syndrome, Williams's syndrome, Sickle disease and lumbosacral myelomeningocele have reported to have been related with pathological changes of sella turcica. The deformity of the sella turcica is often a major clue that an abnormality exists within the cranium, hence knowledge regarding the anatomy and

radiological appearance of sella turcica is important. The computed tomography (CT) based morphometric data of sella turcica in the Nepalese population are limited. Thus, the aim of present study was to estimate the normal size of sella turcica in Nepalese population using CT images of the skull and to determine whether its' size vary with age and sex.

METHODS

This cross-sectional study was conducted from 11th April to 12th July, 2024 in Department of Radiology, Gandaki Medical College Teaching Hospital & Research center, Pokhara, Nepal. Convenience sampling method was used. Based on the study by Makaju et al., at 95% confidence interval and prevalence of 20.5%, using sample size of 250 was calculated.[8] Ethical clearance was obtained from Institutional Review Committee of Gandaki Medical College. (Ref. No. 09/078/07) A verbal informed consent was obtained from the patients prior to data collection.

Patients aged >18 years, who were advised for CT head were included in the study. The patients with pre-existing intracranial lesions, Down's syndrome, William's syndrome, Sickle disease, lumbosacral myelomeningocele, associated hypopituitarism and dwarfism with small sella turcica were excluded. Also, poor quality of CT images and CT scans with incomplete information were excluded.

The study parameters included demographic data, length, antero-posterior diameter and depth of sella turcica. The age and sex of the patients were recorded. For CT head, images were obtained with the patient in a standard supine position (scanning time: 14–18 s; field of view:18 × 13 cm; exposure time: 3.6 s; kV =110; mA = 1–11; voxel size: 0.2 mm^3) using the device (160 slice Canon prime Mulridetector Sp). The head of the patient was placed in a horizontal position so that Frankfort horizontal plane was perpendicular to the table, and the head within circular gantry housing the X-ray tube to ensure consistent orientation of the sagittal images. One of the axial views of the dorsum sella was selected as a reference view. Subsequently, in midsagittal plane, the measurement of length, antero-posterior and depth of sella turcica was done. Based on Silverman[9] and Kissing,[10] the following dimensions were measured to determine the size of sella turcica: the length from tip of dorsum sella (DS) to tip of tuberculum sella (TS); the depth as a perpendicular from line extending from above line to the deepest point of floor of fossa i.e, base of the pituitary fossa (BPF); and the antero-posterior diameter as the furthest point on the posteroinferior aspect of the pituitary fossa to the most superior point on the tuberculum sella (Figure 1). The data were collected by a single radiologist and recorded in the proforma.

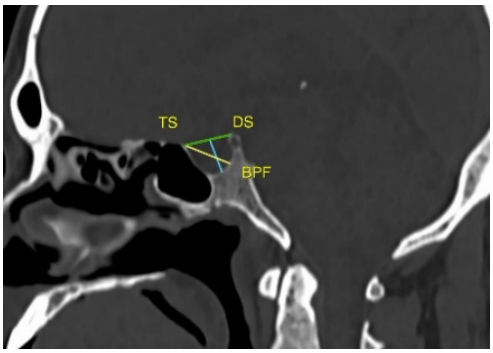

Figure 1: Reference lines used for measuring dimensions of sella turcica on saggital section. TS-tuberculum sella, DS-dorsum sella, BPF-base of pituitary fossa

The data were entered into the excel sheet and was analyzed using statistical package for social sciences (SPSS) version 21.0. Univariate analysis including frequencies and percentage of demographic data and size of sella turcica were calculated. ANOVA test was used to determine the association between size of sella turcica with age groups. Independent t-test was used to determine association of size of sella turcica with gender where p-value <0.05 was considered statistically significant.

RESULTS

A total of 250 patients were evaluated for the measurement of sella turcica. Most of the patients 127(50.80%) were from age groups >50 years and least 38(15.20%) in 18 to 30 years. The proportion of male 32(52.80%) were more than females 118(47.20%). (Table 1) The mean length, AP diameter and depth of sella turcica was found to be 10.94±6.90 mm, 12.42±2.26 mm and 7.99±1.49 mm respectively. (Table 2)

Table 1: Demographic details of the study participants (n=250)

Age groups	Frequency n(%)
18-30	38(15.20%)
31-40	41(16.40%)
41-50	44(17.60%)
>50	127(50.80%)
Gender	
Male	132(52.80%)
Female	118(47.20%)
Total	250(100%)

Table 2: Dimension of sella turcica

Dimensions	Mean ±SD
Length	10.94±6.90 mm
AP diameter	12.42±2.26 mm
Depth	7.99±1.49 mm

There was statistically significant increase in length and AP diameter of sella turcica with increasing age. (Table 3) Further analysis with post-hoc Tukey test showed that there was statistically significant difference in both the length and AP diameter between 18 to 30 years and >50 years. (>50 years more than 18 to 30 years; $p<0.001$, $p<0.05$ respectively) However, on comparing between other age groups, though there was increase in length and AP diameter with increasing age, this finding was statistically insignificant. Furthermore, the depth of sella turcica was found to be increasing with increase in age which was not statistically significant.

The length, AP diameter and depth of sella turcica was highest for males than females. However, these differences were not significant. (Table 4)

Table 3: Association of size of sella turcica with age-groups

Dimensions (mm)	18-30 years	31-40 years	41-50 years	>50 years	F-statistic*	p-value
Length	9.27±2.31	10.06±2.13	10.21±1.47	11.19±2.31	9.29	<0.001**
AP diameter	11.47±2.04	12.17±2.70	12.32±1.76	12.82±2.25	3.88	0.010**
Depth	7.68±1.10	7.68±1.28	8.10±1.57	8.14±1.62	1.65	0.179

*ANOVA test; **p<0.05 denotes statistical significance

Table 4: Association of size of sella turcica with gender

Dimensions	Male	Female	p-value*
Length	10.68±2.46 mm	10.23±9.70 mm	0.289
AP diameter	12.46±2.28 mm	12.38±2.25 mm	0.781
Depth	8.03±1.62 mm	7.94±1.34 mm	0.606

*Independent t-test

DISCUSSION

The normal anatomy and variations in the size of sella turcica should be acquainted by clinicians, in order to analyze deviations that may reflect pathological situations. Thus, our study aimed to determine the normal size of sella turcica in Nepalese population using CT images and its association with age and sex. These findings establish reference data for normal CT dimensions of the sella turcica in Nepalese adults.

Our study showed dimensions of sella turcica as mean length 10.94 mm, mean antero-posterior diameter as 12.4 mm and mean depth as 7.99 mm. These findings were lesser than reported by Zagga et al.[4] Also, these findings were lesser than Okunnaike et al.[11] and Usman et al.[12] done on Nigerian population. Further the values were even larger than reported by Elnour et al.[13] However, the length and depth were more and antero-posterior diameter was less comparing with the study done by Makaju et al.[8] and Issrani et al.[14] Further, lesser antero-posterior diameter, more depth and equal length of sella turcica was reported by AL-Mohana et al.[15] These variations may be due to use of a different sample size, differences in software used in taking measurement as well as CT scan machine configuration. Further, this difference could be due to the shortfall of the radiographic method.

Our study showed significant increase only in length and AP diameter of sella turcica with increasing age, which is similar to the study done by Muhammed et al.[16] Further, the studies done by Al-Mohana et al.[15] and Valizadeh et al.[17] noticed significant differences only in anteroposterior diameter of sella among age groups. According to Nagaraj et al.[18] the depth and antero-posterior diameter of the sella turcica increased as the age of the patient increased. However, significant difference in all the dimensions of sella turcica was reported by Makaju et al.[8] and Issrani et al.[14] Also, there are studies showing no significant difference in any dimension of sella turcica.[11,13,19] This variation may be due to different sample size. Therefore, age group of the patients may not a major determinant of the dimensions of sella turcica.

Our study concluded there was no significant difference in the size with gender. Similar findings were note by Makaju et al.[8] and Elour et al.[13] However, there was noted slightly larger dimension in males as in the study by Ogunnaike et al.[11] and Chou et al.[19] This could be attributed to sexual dimorphism in form of thicker bones and prominent bony markings in the males compared to that of females and anatomical features of the human skull which tend to be larger in males than in females. On contrary some studies have also reported females with larger sella.[14,20] The differences between studies could be explained by the fact that study samples are from different age groups.

Several limitations were identified in the study. Firstly, the research was conducted at a single institution, it cannot be said that the study reflects the overall characteristics of the kaski district. Secondly the sample size was less. In spite of this, the dimensions reported in this study can still be used as a guideline. However, further studies on inter-relation between the dimensions of the sella turcica and pathological conditions should be conducted with the use of advanced imaging methods.

CONCLUSIONS

The study deduced that the mean length, antero-posterior and depth of sella turcica was 10.94 mm, 12.42 mm, and 7.99 mm respectively. Furthermore, the length and antero-posterior diameter of sella turcica increased with age but show no significant variation by gender.

ACKNOWLEDGEMENTS

The authors would like to thank all the patients involved in the study.

CONFLICTS OF INTEREST: None declared

SOURCE OF FUNDING: None

AUTHORS' CONTRIBUTIONS

NP did concept and design of research literature search, data collection, analysis and interpretation, manuscript preparation and editing. PS and KS did literature search, data analysis and interpretation, and manuscript editing. SP, KT, KG did literature search, data analysis, and manuscript editing. All the authors have read and approved the final draft.

REFERENCES

1. Sathyanarayana HP, Kailasam V, Chitharanjan AB. The Size and Morphology of Sella Turcica in Different Skeletal Patterns among South Indian Population: A Lateral Cephalometric Study. J Ind Orthod Soc. 2013;47(4):266–71. DOI: 10.1177/0974909820130507S
2. Mancall E, Brock D. Gray's Clinical Neuroanatomy: The Anatomic Basis for Clinical Neuroscience. 1st Ed. Philadelphia: Elsevier Saunders; 2011.
3. Sinha S, Shetty A, Nayak K. The morphology of Sella Turcica in individuals with different skeletal malocclusions – A cephalometric study. Transl Res Anat. 2020;18:100054. DOI: 10.1016/j.tria.2019.100054
4. Zagga AD, Ahmed H, Tadros AA, Saidu SA. Description of the normal variants of the anatomical shapes of the sella turcica using plain radiographs: experience from Sokoto, Northwestern Nigeria. Ann Afr Med. 2008;7(2):77–81. DOI: 10.1016/0889-5406(87)90394-5 PMID: 3554978.
5. Chintaman Saokar P, Nawale S. The Comparative Study of Size of Sella Turcica in Different Skeletal Types In Local Population–An in Vitro Study. Indian J Appl Res. 2014;4(10):160–2.
6. Kantor ML, Norton LA. Normal radiographic anatomy and common anomalies seen in cephalometric films. Am J Orthod Dentofacial Orthop. 1987;91(5):414–26. DOI: 10.1016/0889-5406(87)90394-5 PMID: 3554978.
7. Bruneton JN, Drouillard JP, Sabatier JC, Elie GP, Tavernier JF. Normal variants of the sella turcica. Radiology. 1979;131(1):99–104. DOI: 10.1148/131.1.99 PMID: 424612.
8. Makaju G, Joshi BR, Chand RB. Assessment of the Size of Sella Turcica among Nepalese Population by Computed Tomography. Nepalese Journal of Radiology. 2019;9(2):40–7. DOI: 10.3126/njr.v9i2.27429
9. Silverman FN. Roentgen standards fo-size of the pituitary fossa from infancy through adolescence. Am J Roentgenol Radium Ther Nucl Med. 1957;78(3):451–60.
10. Kisling E. Cranial Morphology in Down's syndrome: A comparative roentgencephalometric study in adult males. Copenhagen: Munksgaard; 1966. 107 p.
11. Philip Olubunmi O. An Assessment of the Size of Sella Turcica Among Adult Nigerians Resident in Lagos. Int J Med Imaging. 2016;4(3):12–6. DOI: 10.11648/j.ijmi.20160403.11
12. Usman Z, Zagga AD, Yunusa GH, Abubakar U, Bello A, Usman JD, et al. Shapes and Sizes of Sella Turcica Using Computerized Tomography (CT) from Tertiary Hospital in Sokoto, Nigeria. Asian J Med Health. 2020;18(1):8–15. DOI: 10.9734/ajmah/2020/v18i130175
13. Elnour H. Evaluation of Shape and Size of Sella Turcica Using Computerized Tomography in Saudi Populations. Sch J Appl Med Sci. 2020;8(9):2058–63. DOI: 10.36347/sjams.2020.v08i09.016
14. Issrani R, Alanazi SH, Alrashed FF, Alrasheed SS, Bader AK, Prabhu N, et al. Radiographic Analysis of Morphological Variations of Sella Turcica in Different Skeletal Patterns Among Saudi Subpopulations. Int J Gen Med. 2023;16:2481–91. DOI: 10.2147/IJGM.S413903 PMID: 37342405.

15. AL-Mohana RAAM, Muhammed FK, Li X, Lubamba GP. The bridging and normal dimensions of sella turcica in Yemeni ndividuals. Oral Radiol. 2022;38(1):162–70. DOI: 10.1007/s11282-021-00541-7 PMID: 34143355.

16. Muhammed FK, Abdullah AO, Liu Y. A morphometric study of the sella turcica: race, age, and gender effect. Folia Morphol. 2020;79(2):318–26. DOI: 10.5603/FM.a2019.0092 PMID: 31448402.

17. Valizadeh S, Shahbeig S, Mohseni S, Azimi F, Bakhshandeh H. Correlation of Shape and Size of Sella Turcica With the Type of Facial Skeletal Class in an Iranian Group. Iran J Radiol. 2015;12(3):e16059. DOI: 10.5812/iranjradiol

18. Nagaraj T, Shruthi R, James L, Keerthi I, Balraj L, Goswami RD. The size and morphology of sella turcica: A lateral cephalometric study. J Med Radiol Pathol Surg. 2015;1:3–7. DOI: 10.15713/ins.jmrps.14

19. Chou ST, Chen CM, Chen PH, Chen YK, Chen SC, Tseng YC. Morphology of Sella Turcica and Bridging Prevalence Correlated with Sex and Craniofacial Skeletal Pattern in Eastern Asia Population: CBCT Study. BioMed Res Int. 2021;2021:1–13. DOI: 10.1155/2021/6646406 PMID: 33860047.

20. Magat G, Ozcan Sener S. Morphometric analysis of the sella turcica in Turkish individuals with different dentofacial skeletal patterns. Folia Morphol. 2018;77(3):543–50. DOI: 10.5603/FM.a2018.0022 PMID: 29500897