

Radiographic Analysis of Morphological Variations of Sella Turcica of Children in the Region of Mahe: An in Vitro Study

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Abstract: *The sella turcica is an important anatomical landmark in lateral cephalometric analysis and is commonly used to assess craniofacial growth and skeletal relationships in children. Variations in its size and shape may also provide useful information about developing craniofacial conditions. This study aims to determine the dimensions and morphological variations of the sella turcica among children from the Mahe region and to compare these dimensions between boys and girls. A retrospective assessment will be carried out using 60 digital lateral cephalograms, comprising 30 boys and 30 girls. The length, depth, and anteroposterior diameter of the sella turcica will be measured using standard anatomical reference points, while its morphological variations will also be recorded. Children with craniofacial trauma, surgery, congenital deformities, relevant medical conditions, or poor-quality radiographs will be excluded. The collected measurements will be statistically analysed to identify variations within the study population and differences between genders. The study is expected to provide regional reference data for the sella turcica in children and may support early assessment of skeletal discrepancies during interceptive orthodontic evaluation.*

Keywords: Sella turcica; Lateral cephalogram; Morphology; Children; Cephalometry; Craniofacial growth

1. Introduction

Neuroanatomical landmarks serve as key reference points in cephalometric studies, facilitating precise investigations. Among these, the Sella Turcica, a saddle-shaped structure located in the middle cranial fossa, encloses the pituitary gland. It is composed of two anterior and posterior glenoid processes, a central depression known as the Sella, and the pituitary or hypophyseal fossa, which is covered by the diaphragm sellae. As a stable landmark, the Sella point (S) is widely utilized in cephalometric analysis to evaluate craniofacial growth and jaw relationships, particularly in interceptive orthodontics in pediatric dentistry. Moreover, its study is crucial in identifying craniofacial pathologies and syndromes, including acromegaly, gigantism, Cushing's disease, glandular hyperplasia, and hypopituitarism. Understanding the normal anatomy and morphological variations of the sella turcica in the region of Mahe, is therefore vital, as its measurements can provide valuable reference standards for future research of children in this region.

Aim

To determine the dimensions and morphological variations of the Sella turcica in children of age 6-12 years in the region of Mahe.

Objective

- To determine the dimensions and morphological variation of the Sella turcica in children
- To compare the dimensions of the Sella turcica between girls and boys in the study population

2. Review of Literature

- 1) Valizadeh S et al (2015) conducted a study to investigate relationship in patients referred to a dental school in Iran. In this descriptive-analytical study, cephalometric radiographies of 90 candidates for orthodontic treatment (44 females and 46 males) with an age range of 14 - 26 years and equal distribution in terms of class I, class II, and class III facial skeletal classification were selected. The shape, length, diameter, and depth of the sella turcica were determined on the radiographs. Sella turcica had normal morphology in 24.4% of the patients while irregularity (notching) in the posterior part of the dorsum sella was observed in 15.6%, double contour of sellar floor in 5.6%, sella turcica bridge in 23.3%, oblique anterior wall in 20% and pyramidal shape of the dorsum sella in 11.1% of the subjects. In total, 46.7% of class I patients had a normal shape of sella turcica, 23.3% of class II patients had an oblique anterior wall and a pyramidal shape of the dorsum sella, and 43.3% of class III individuals had sella turcica bridge (the greatest values). Sella turcica length was significantly greater in class III patients compared to class II and class I ($P < 0.0001$).
- 2) Chaitanya B et al (2018) conducted a study to determine the average dimensions and morphological variations of the sella turcica in different age groups and to evaluate any difference in size between males and females in the study population. With age range between 7 and 43 years, all the radiographs were distributed according to skeletal class and gender. Size and morphology of sella turcica were recorded and compared with age, gender, and skeletal class. The mean age of the study population was found to be 16.8 years comprising 48.6% males and 51.3% females. There was a gradual increase in linear dimensions of sella turcica with the advancement of age.

The normal sella was observed in 20.6%, whereas 79.35% showed variation in morphology. Oblique anterior wall was a most common abnormal variant, whereas pyramidal shaped dorsum was rarest.

- 3) Magat G et al (2018) The aim of this study was to evaluate the morphometric analysis of sella turcica in a Turkish population according to gender, age, and dentofacial skeletal type and to investigate the prevalence of sella turcica shapes in different dentofacial skeletal types. The lateral cephalometric radiographs of 362 patients (145 males, 217 females) were included and grouped by age, gender, and dentofacial skeletal patterns. Linear dimensions of sella turcica, which include the length, height, and diameter, were measured, and the shapes of sella turcica were evaluated. The anatomical variants of the sella turcica in this study were normal morphology (39.0%), followed by pyramidal shape (15.5%), double contour of floor (14.6%), oblique anterior wall (14.4%), irregular dorsum sella (8.6%), and sella turcica bridge (8.0%). Significant differences were found between sella turcica shapes and dentofacial skeletal types ($p < 0.01$). Females had greater diameter size of sella turcica than males ($p < 0.01$). In addition, the subjects in the 15-21 age group had larger sella turcica depths and diameters than the subjects in the 9-14 age group ($p < 0.05$ and $p < 0.01$, respectively). However, no significant differences were found between age groups in terms of sella turcica lengths ($p > 0.05$).
- 4) Rakhi Issrani et al (2023) assessed and compared the linear dimensions and shape of sella turcica on digital lateral cephalograms in Saudi subpopulation with different skeletal patterns, age groups and genders. A total of 300 digital lateral cephalograms were retrieved from the hospital archive. The selected cephalograms were grouped based on the age, gender, and skeletal types. The linear dimensions and shape of sella turcica were measured on each radiograph. To test the inter-relationship of age, gender, and skeletal type with the dimensions of sella turcica, regression analyses were used. Significant differences in linear dimensions between the age groups ($P < 0.001$) and genders ($P < 0.001$) were noted. On comparing sella size with different skeletal types, a significant difference was found for all sella dimensions ($P < 0.001$). The mean length, depth and diameter among skeletal class III were significantly higher than that among classes I and II. On comparing age, gender, and skeletal type with size of sella, age and skeletal type were significantly related to the change of length, depth and diameter ($P < 0.001$), whereas gender was found to be significantly related only to a change in length of the sella ($P < 0.01$). For the sella shape, normal morphology was noted in 44.3% of patients.
- 5) Poorsoleiman T et al (2024) conducted a study to assess different morphological types of the Sella turcica in lateral cephalometric radiographs and its correlation with malocclusion, as well as the relationship between gender and linear measurements of sella turcica. The lateral cephalometric radiographs of 410 volunteers (111 men and 299 women) aged 8 to 30 years were evaluated. The patients were divided into three groups based on their skeletal growth patterns (cl I, II, and III). Then the anatomical shape and linear dimensions of sella turcica

were assessed. Measurements were made using Adobe Photoshop Version: 20.0.0 software, and data analysis was performed by IBM SPSS Statistics version 25. The following morphologies were observed: normal (37.8%), oblique anterior wall (9.3%), double contour of the floor (21.5%), sella turcica bridge (8.8%), irregularity (notching) in the posterior part of sella turcica (16.6%), and pyramidal shape of the dorsum sellae (6.1%). No statistically significant relationship was found between sella turcica variations and skeletal malocclusion. The correlation between female sex with the diameter ($p=0.027$) and depth values ($p=0.035$) of sella turcica was statistically significant. There was no statistically significant difference ($p>0.05$) in length based on gender.

3. Materials and Methods

The ethical clearance for the study will be obtained from the Ethical committee of Mahe Institute of Dental Sciences and Hospital, Mahe. The written consent will be taken from the parents of children whose lateral cephalograms are being taken for the study. The retrospective study will be conducted on 60 (consisting of 30 girls and 30 boys) digital lateral cephalograms of child patients who came to the Department of Pediatric and Preventive Dentistry for interceptive orthodontic procedures. The lateral cephalograms will be taken with standardised procedure. The depth, length and the anteroposterior diameter of the Sella turcica will be measured by a single investigator.

Armamentarium

- Matte acetate paper
- 2H Pencil
- Mathematical protractor and scale
- Lateral cephalograms

Size of Sella Turcica

- The distance between the tuberculum and the tip of the dorsum sella will be used to calculate the length of the sella.
- The depth will be determined by drawing a line perpendicular from the line joining tuberculum sella and dorsum to the deepest point on the floor.
- The antero-posterior diameter of sella turcica will be measured from the farthest point on postero-inferior aspect of the hypophyseal fossa to the superior most point on tuberculum sella.

Inclusion Criteria

- Radiographs with clearest representation of the Sella turcica in the lateral cephalogram
- Children between 8-12 years of age
- Children belonging to Mahe region.
- Parents of children who give consent

Exclusion Criteria

- History of trauma/surgery to the craniofacial region;
- Presence of craniofacial congenital deformities
- Presence of relevant medical history and clinical records.
- Poor quality of lateral cephalograms

4. Results

Length, depth and diameter of sella turcica on digital lateral cephalograms will be assessed. The collected data will be tabulated in a spreadsheet using Microsoft Excel 2021 and the value will be statistically analysed using SPSS software 27.0

5. Sample Size

A minimum sample size of 60 (i.e., $N=60$) subjects with 20($n=20$) subjects per group as determined using G*Power Software version 3.1.9.7 using an analysis of variance model with an effect size of 0.42 (referenced from a study by Issrani *et al.*, 2023), alpha error of 0.05, power of 80%.

6. Clinical Significance

The Sella turcica is an important point in the analysis of lateral cephalograms of children for the determination of skeletal discrepancies. No study has been done on the dimensions of Sella turcica in the region of Mahe. Changes in the dimensions of the Sella turcica may give us important information as to the developing malocclusion and predict its various characteristics at a very early age in children.

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Consent Letter for Subjects

I have no objection in my child participating in the study entitled "Radiographic Analysis of Morphological Variations of Sella Turcica in children in the region of Mahe: an in vitro study" by Dr. Muhammad Vajid C under the guidance of Dr. Rena Ephraim. I understand that my child's identity will not be disclosed to anyone without my permission and the sample collected will be utilized only for research for the benefit of the patients. I have the right to withdraw from the study at any moment and the sample collected will be utilised only with my permission.

Note: the consent letter will be printed in English as well as in the language of the subjects, if the subject is illiterate, it will be read and the consent letter will be translated into the mother tongue Malayalam by one of the close relatives of the subject and will be signed and/or thumb impressed by both of them.

Signature/thumb impression of the subjects
Signature

Investigators Name
Dr. Muhammad Vajid C

Signature

Signature of the relative
Name and relation

പങ്കാളിയുടെ സമ്മതപത്രം

" Radiographic Analysis of Morphological Variations of Sella Turcica of children in the region of Mahe: an in vitro study" എന്ന തലക്കെട്ടിലുള്ള പഠനത്തിൽ ഭാഗമാകുന്നതിൽ എനിക്ക് യാതൊരുവിധ എതിർപ്പും ഇല്ലെന്നും, എന്റെ മകൻ/ മകളുടെ പേരോ മേൽവിലാസമോ വെളിപ്പെടുത്തുകയില്ലെന്നും, ഈ പഠനത്തിൽ നിന്നും എപ്പോൾ വേണമെങ്കിലും പിൻമാറാൻ അവകാശമുണ്ടെന്നും പഠന വിവരങ്ങൾ എന്റെ അനുവാദത്തോടുകൂടി മാത്രമേ ഉപയോഗിക്കുകയുള്ളൂവെന്നും ഞാൻ മനസ്സിലാക്കുന്നു.

കുറിപ്പ്: പങ്കാളിയുടെ സമ്മതപത്രം ഇംഗ്ലീഷിലും, മലയാളത്തിലും അച്ചടിക്കുന്നതാണ്. പങ്കെടുക്കുന്നയാൾ നിരക്ഷരരാണെങ്കിൽ അവരുടെ സാന്നിധ്യത്തിൽ അടുത്ത ബന്ധുവായിച്ചു കേൾപ്പിക്കുന്നതായിരിക്കും.

രക്ഷിതാവിന്റെ

ഗവേഷകന്റെ
പേര്

ഒപ്പ്
കൈവിരലടയാളം

ബന്ധുവിന്റെ
ഒപ്പ്
കൈവിരലടയാളം
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