RADIOLOGICAL MEASUREMENT OF ETHMOID SINUS DIMENSIONS AND ITSCORRELATION WITH CHRONIC RHINOSINUSITIS

SUBMITTED BY

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OTORHINOLARYNGOLOGY

UNDER THE GUIDANCE OF

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2022-2025

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ABSTRACT

BACKGROUND:

Chronic rhinosinusitis is defined as inflammation of the nose and paranasal sinuses characterized by two or more symptoms, one of which should either be nasal blockage or obstruction or congestion or nasal discharge, ±facial pain/pressure, ±reduction or loss of smell and either endoscopic signs of - nasal polyps and/or - mucopurulent discharge primarily from middle meatus and/or - oedema or mucosal obstruction primarily in middle meatus and/or CT changes like mucosal changes within the osteomeatal complex and/or sinuses. (EPOS 2020)

Among Indians, this disease is more widespread than diabetes, asthma, or coronary heart disease.

One in eight Indians suffer from chronic sinusitis caused by the inflammation of the nasal and throat lining, which results in the accumulation of mucus in the sinus cavity and pressure build-up in the face, eyes, and brain [(2)]

Although the diagnosis of CRS is based primarily on clinical criteria, the CT provides objective evidence for the diagnosis and staging of chronic rhinosinusitis and also provides an essential roadmap to Paranasal sinus anatomy should surgery be considered. [(3)]

Considering the high prevalence of rhinosinusitis and the high cost of rhinosinusitis treatment, knowing ethmoid sinus pathology and its alteration may increase the efficacy of rhinosinusitis treatments and reduce surgery-associated complications. [(4)]

AIM:

To look for a correlation between the ethmoid sinus measurements in chronic rhinosinusitis patients and those without chronic rhinosinusitis.

METHODOLOGY:

Radiological (computed tomography) measurement of the ethmoid sinus dimensions (width and height), their symmetry, ethmoid roof symmetry and depth of olfactory fossa measured in cases of chronic rhinosinusitis and normal patients.

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RESULTS:

Our study found a significant correlation between ethmoid sinus dimensions and CRS, as well as ethmoid width asymmetry and CRS (0.041). However, ethmoid roof asymmetry and Keros' classification did not show a statistically significant association with CRS, indicating that these anatomical variations are not primary risk factors.

CONCLUSIONS:

This study has significant clinical implications in surgical planning, underscoring the importance of Computed Tomography in assessing ethmoid sinus anatomy in CRS pathophysiology.

Keywords-

CRS- Chronic Rhinosinusitis

CT- Computed Tomography

CRSwNP- Chronic Rhinosinusitis with Nasal Polyposis

CRSsNP- Chronic Rhinosinusitis without Nasal Polyposis

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INTRODUCTION AND NEED FOR STUDY

Chronic rhinosinusitis affects both the paranasal sinus system and the nasal cavity.

It is characterized as inflammatory processes of the nasal and paranasal sinus system, identified by the presence of 2 or greater than 2 symptoms: nasal blockage, congestion, or discharge, with possible facial pain or pressure, reduced/lost sense of olfaction and endoscopic findings such as nasal polyposis, mucopurulent discharge, oedema or obstruction in the middle meatus, and radiological findings suggestive of mucosal alterations in the osteomeatal complex or the sinus.[1]

This medical condition is significantly more prevalent among Indians than diabetes, asthma, or coronary heart disease, and it is emerging as one of the most widespread chronic disorders. Chronic sinusitis, resulting from inflammation of the nasal and pharyngeal mucosa, affects one in eight Indians. This disorder results in mucus accumulation in the paranasal sinuses, which has direct effect on the surrounding structures like the face, eyes, and brain[2]. Despite not being life-threatening, rhinosinusitis symptoms are linked to a sharp decline in quality of life.[3]

Numerous complex anatomical and physiological variables contribute to the multifactorial aetiology of chronic rhinosinusitis. Consequently, it is imperative to identify them to manage the illness efficiently and improve the patients' quality of life.

Although this disease is based on clinical presentation, a CT provides conclusive evidence for the diagnosis and staging. It serves as an essential reference for the anatomy of the paranasal sinuses should surgical intervention become necessary.[4]

The advantage of MRI and computed tomography lies in their ability to provide accurate anatomical details in sequential tomographic slices, thereby avoiding the volumetric averaging associated with conventional radiographs.[5]

Furthermore, CT is crucial for excluding the existence of severe infections or tumours that demonstrate local invasion, bone destruction, and extra-sinus extension. CT aids in the diagnosis and treatment of chronic and recurrent sinonasal disorders by delineating the disease's spread and severity. Due to its superior 3D resolution, it is optimal for delineating the complex sinonasal architecture and anatomical variances that are not discernible by endoscopic or clinical assessment.[6]

Computed tomography (CT) is the optimum modality for evaluating the nasal cavity and paranasal sinuses before surgical intervention, serving as the gold standard for delineating inflammatory sinus pathology resulting from obstruction.[7]

The ethmoid sinus has the most morphological diversity among the paranasal sinuses[8]. It is in proximity to several significant structures, including the base of the skull, the olfactory tract, and the orbits.

The quantity of ethmoid sinuses varies considerably due to its diverse growth patterns. Its magnitude and possible clinical implications are, however, little addressed. The predominant cause of revision procedures is attributed to the ethmoid sinus, which is central to inflammatory conditions. Investigations have been conducted about the associations between variations in the ethmoid sinus and Haller cells, septal deviation, and notably, the presence of a prominent ethmoid bulla. Nonetheless, there is scant evidence to substantiate an association between the incidence of rhinosinusitis, roof symmetry, and the dimensions of the ethmoid sinus in terms of breadth and height.

Considering the widespread occurrence of CRS and the substantial expense associated with its treatment, comprehending ethmoid sinus pathology as well as its alterations can enhance treatment efficacy for rhinosinusitis and reduce the likelihood of surgical complications.[9]

HISTORY OF PARANASAL SINUSES AND DISCOVERY

A multitude of medical practitioners from dentistry, otorhinolaryngology, and maxillofacial surgery exhibit a specific interest in the paranasal sinuses. The etymology of the terms "sinus" and "antrum" marks the inception of the history of paranasal sinuses. The Latin term "sinus" denotes a bay, gulf, or a curvature or depression in the terrain.[10]

The ancient Egyptians were the first to identify paranasal sinuses within the cranial bones. They might have possessed knowledge of the maxillary sinuses, as medical records from 3700 to 1500 BC indicate their familiarity with the characteristics of the maxilla. The most astonishing evidence indicates that the Egyptians utilized sophisticated instruments to remove the brain via the nasal cavity—presumably through the ethmoid cells—during the mummification of a human corpse. Consequently, sinus surgery is attributed to the ancient Egyptians. Hippocrates included instructions on the management of nasal polyps in his works.[11] Aulus Celsus subsequently elaborated on the surgical structure of the nasal cavity and olfactory tract traversing the lamina cribriosa of the ethmoid roof.[12] Da Vinci initially illustrated the maxillary and frontal sinuses in 1489.

Despite considerable progress in anatomy, their physiological function remained elusive for an extended duration. Schneider was the first to identify that the mucus in the paranasal sinuses originated from the paranasal structures rather of being generated by the brain; in 1660, Harris Mosher of Harvard University conducted dissections of multiple cadavers to investigate the anatomy of the paranasal sinuses.[13] He is also acclaimed for precisely delineating the anatomy of the ethmoid sinuses. He said that intranasal ethmoidectomy was "the easiest way to kill a patient" because of its proximity to the orbit and the base of the skull.[14] The distinguished Austrian anatomist Emil Zuckerkandl published the first comprehensive anatomical and pathological account of the paranasal sinuses in late 1800s.

Zuckerkandl's meticulous and precise studies and illustrations established him as the "father" of modern sinus anatomy and formed the foundation for most of contemporary understanding.[15]

In the initial decades, conventional radiography served as the diagnostic modality for evaluating head and neck disorders, particularly in non-invasive procedures for understanding the anatomy and pathophysiology of the paranasal sinuses. Special radiographic projections were developed to illustrate anomalous processes in the neck, base of the skull, temporal bones, and paranasal sinuses. Since its inception in 1932, linear tomography has enabled the acquisition of sections that reveal anomalies challenging to delineate in conventional radiography. Thin-section polytomography was created to enhance linear tomography.[16]

The development and growth of the ethmoid bone do not explain its biological trait of pneumatizing adjacent bones or its ability to extend into paranasal sinus canals. Thus, the physiology and pathology of the paranasal sinuses and the ethmoid complex may vary considerably due to their status as separate organs.

The human nose is an evolutionary amalgamation of three structures: the respiratory nose, the olfactory nose, and the paranasal sinuses, which reshape bones.

CHRONIC RHINOSINUSITIS

Chronic rhinosinusitis (CRS) affects 1 in 8 individuals in India, comprising roughly 5-15% of the urban population. The prevalence of sinusitis exceeds that of any other chronic condition and is increasing.[17]

Traditionally, CRS is classified into categories on the existence or lack of polyposis. Their aetiology was considered significantly different for a prolonged duration, with CRSsNP viewed as the result of poorly controlled acute bacterial infection that later developed into a 'chronic' state, whereas CRSwNP was linked to local or systemic 'allergy.'

The current consensus holds that CRS is a disorder exhibiting a multifaceted aetiology resulting out of a dysfunctional interaction between various environmental factors and the host immune system.

The nasal cavity and paranasal sinuses harbor bacteria. Beginning at birth, a process involving rapid colonization by commensal organisms enables the soft tissue in healthy individuals to serve as a barrier that regulates interactions with our immune system, promoting adaptability as well as harmony while avoiding or relieving inflammation. In those suffering from CRS, the protective layer is compromised, leading to chronic inflammation that frequently results in tissue remodeling and clinical symptoms. The remodeling of sinonasal tissues in chronic rhinosinusitis (CRS) largely entails polyp formation, goblet cell hyperplasia, and epithelial barrier impairment, which substantially contribute to CRS symptoms.

In addition to examining the physical mucociliary barrier, focus is placed on finding the activated molecular pathways. During infection, a self-limiting defensive reaction is activated, typified by a range of cellular activities targeting one of the three pathogen classes:

Type one immune responses specifically for viral pathogens.

Type two reactions primarily aim at parasitic organisms.

Type three targets extracellular bacteria and fungi;

These reaction help in re-establishing of protective layer integrity. In cases of CRS, membrane penetration results in a chronic inflammation that remains unresolved, typically utilizing all the pathways either separately or together. Type 2 inflammatory processes is characterized by the presence of cytokines Interleukin-4, Interleukin-5, and interleukin-13, as well as the recruitment of granulocytes.
CRSwNP primarily displays type 2 inflammatory response, while CRSsNP reveals a more diverse inflammatory response.

Recent findings reveal that both types exhibit heterogeneous inflammation described by three unique endotypes based on immune response.
Type 1 (T1): Characterised by Th1 cells and interferon-gamma (IFN-γ) cytokines
Type 2 (T2): Facilitated by Th2 cells, granulocytes and cytokines
Type 3 (T3): Defined by Th17 cells and IL-17 cytokines, associated with neutrophilic inflammation.
The regional variation in these endotypes complicates the development of a unified therapeutic strategy.
The sinonasal epithelium plays a crucial role in chronic rhinosinusitis by acting as both a physical barrier and an immunological detector. The dysfunction of this barrier contributes to chronic rhinosinusitis (CRS). Moreover, mucociliary clearance (MCC) is impaired, resulting in chronic infection and inflammation.[18]
Thus, the ineffectiveness of etiology-based medical therapies for CRS is, upon consideration, unsurprising, as CRS is typically an adult-onset illness diagnosed primarily lack the fifth decade of life.[18]
Nonetheless, irrespective of the humoral or mucosal factors that facilitate the persistence of the disease, identifying the structural aetiology of chronic rhinosinusitis (CRS) remains a considerable challenge.

Alongside acknowledged anatomical anomalies like septal deviations, variations in the middle turbinate, and hypoplastic sinuses (notably the frontal and maxillary sinuses), it is now broadly accepted that the OMC is disease-free as long as the corresponding sinus passages are healthy and mucociliary transport is unobstructed. Obstruction of the ostiomeatal complex results in sinusitis. Insufficient ventilation in the inflamed sinuses worsens mucociliary clearance, results in mucus stasis, and promotes secondary infection, ultimately leading to heightened blockage and inflammation of the OMC.

This harmful cycle is intensified by structural alterations in the nasal cavity and paranasal sinuses, chiefly concerning the shifting ethmoid cells and components that comprise the ostiomeatal complex (OMC).[19]

ANATOMY AND EMBRYOLOGY OF PARANASAL SINUSES

Maxillary sinus

It forms between 7th to 10th weeks of intrauterine growth, starting with a narrow depression that runs from the primitive ethmoid infundibulum into the bony maxilla by 20th week of gestation.

The cavity experiences fast expansion and pneumatization from childhood until seven years of age, ultimately attaining its final size by 18 years. Evidence indicates that maxillary sinus development is similar in males and females during childhood; however, sexual dimorphism becomes apparent in late adolescence. Research on adults confirms that males have larger maxillary sinuses.[20]

Comprehensive pneumatization of the entire hard palate may be noted occasionally. Any disruption or anomaly in the development of the maxillary sinus may result in aplasia or hypoplasia.[21]

Ethmoid Sinus

It is distinctive among the paranasal sinuses because of its level of ventilation and embryological origin[22]. The ethmoidal cells include a quadrilateral, labyrinthine structure located between the eyes and nose, made of several individual cells divided by thin bony barriers. The lateral boundaries are defined by the orbital wall lamina; the superior boundary by the ethmoidal fovea; the posterior boundary by the sphenoid; and the anterior boundary by the frontal bones.

During the 9th and 10th weeks of gestation, the primordial ethmoidal bulla develops as a cartilage-like projection on the lateral wall of the middle meatus from which the final cells develop. It is detectable at 23 weeks of

intrauterine growth. The posterior cells begin to form before this from the same origin.

All permanent ethmoidal structures are present at birth and derive from these cells and the interstitial grooves. As a result, acute sinusitis in children often impacts the ethmoid cavity, potentially spreading laterally via the lamina papyracea and leading to ocular complications.

Literature indicates that the dimensions of the newborn's ethmoid sinus system are 9 to12 mm in length, 1 to 5 mm tall, and 1 to 3 mm in medial-lateral width. They attain maturity by twelve years.[23]

Understanding the basic embryology of the four or five ethmoturbinals outlines a series of lamellae. The lamellae are organised in an anterior to posterior sequence as follows:

Firstly: agger nasi and uncinate process.

Second: bulla ethmoidalis

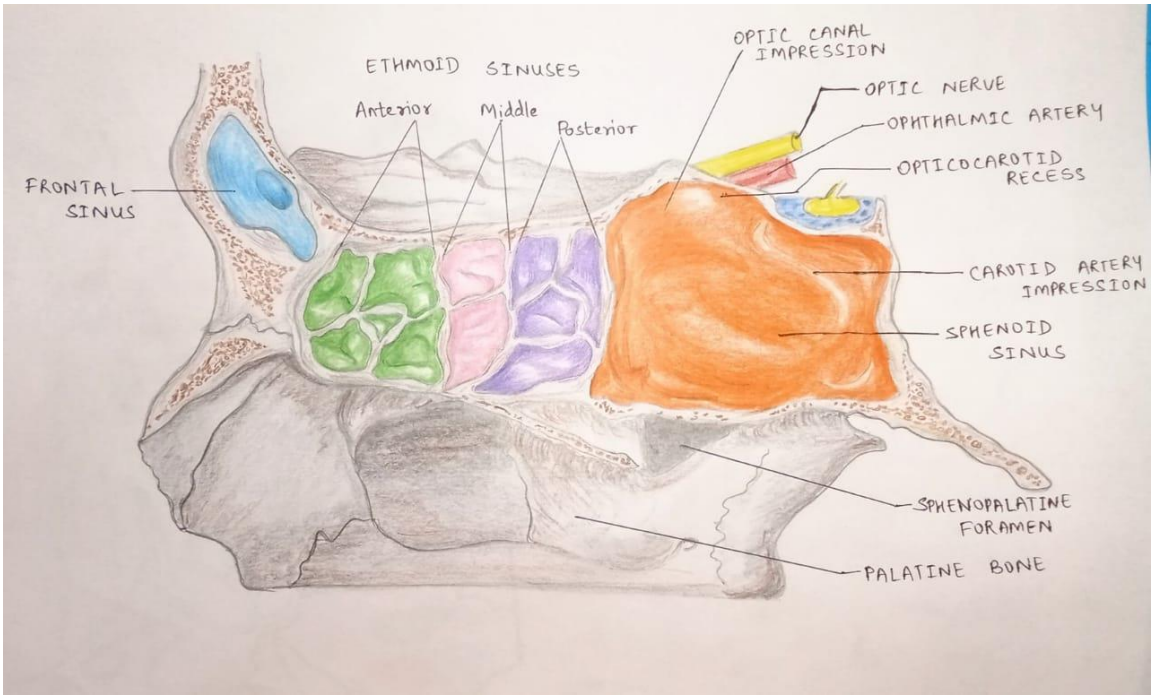
Third: Basal lamella

Fourth: 3rd turbinate

Fifth: 4th turbinate

The ethmoid bone possesses a delicate lamina cribriosa that represents the thinnest portion of the base of skull. The olfactory fossa (OF) is located on the superior aspect of the lamina cribriosa and exhibits variability in dimensions. The diverse estimates of the olfactory fossa depth and the ethmoid roof height significantly elevate the danger of cerebral infiltration during endoscopic procedures within the nasal cavity. It was discovered as high-risk cases with an orbital floor depth between 7 and 16 mm, categorizing them as type III. [24]

FIGURE 1: The Paranasal Sinuses in the sagittal section with surrounding structures



Sphenoid sinus

The sphenoid sinuses are rectangular structures and constitute the most distal of the sinuses.

The sphenoid sinus begins to form in the twelfth week of gestation as an invagination of nasal mucosa from the spheno-ethmoidal recess into the posterior part of the cartilaginous nasal capsules. A small sphenoid sinus is present at birth, with gradual enlargement beginning around age three with the pneumatization of the sphenoid bone.

The sinus extends downward to the pterygoid canal by 7 years, backwards to the hypophyseal fossa by 8 years, laterally towards the anterior clinoid process by 12 years. [25]

The sphenoid sinus is surrounded by several critical anatomical structures, including the pituitary gland superiorly and the cavernous sinus laterally, as well as the upper portion of the middle cranial fossa.

Three distinct pneumatization patterns have been recognised for the sella turcica. Pneumatization patterns are essential for the surgical planning of transsphenoidal approaches to pituitary tumours. The pneumatization patterns comprise sellar (90%), pre-sellar (9%), and conchal (1%) kinds. At times, the pattern results in the exposure of the neural and vascular components next to the sphenoid sinus. The lateral recess extension occurs between the trigeminal nerve and vidian nerve.

Frontal sinus

The frontal sinuses are the last ones to develop. They demonstrate the highest variety in dimensions and morphology among sinuses. Pneumatization of the frontal bone begins in the 16th week of gestation. They generally originate from the anterior ethmoids, the ethmoidal infundibulum and/or the suprabullar recess. This results in a complex drainage system.[26]

At birth, the frontal sinuses present as a small blind pouch, difficult to distinguish from the anterior ethmoid air cells on imaging. The frontal sinuses often become discernible in most radiological assessments by the age of 8 as a result of gradual pneumatization. Significant frontal pneumatization begins in early adolescence and continues until the age of 18.

The proportions of the frontal sinus reach adult ratios between the ages of 10 and 12, just before the second growth spurt, despite continued development.

FIGURE 2: Coronal view of the drainage Patterns

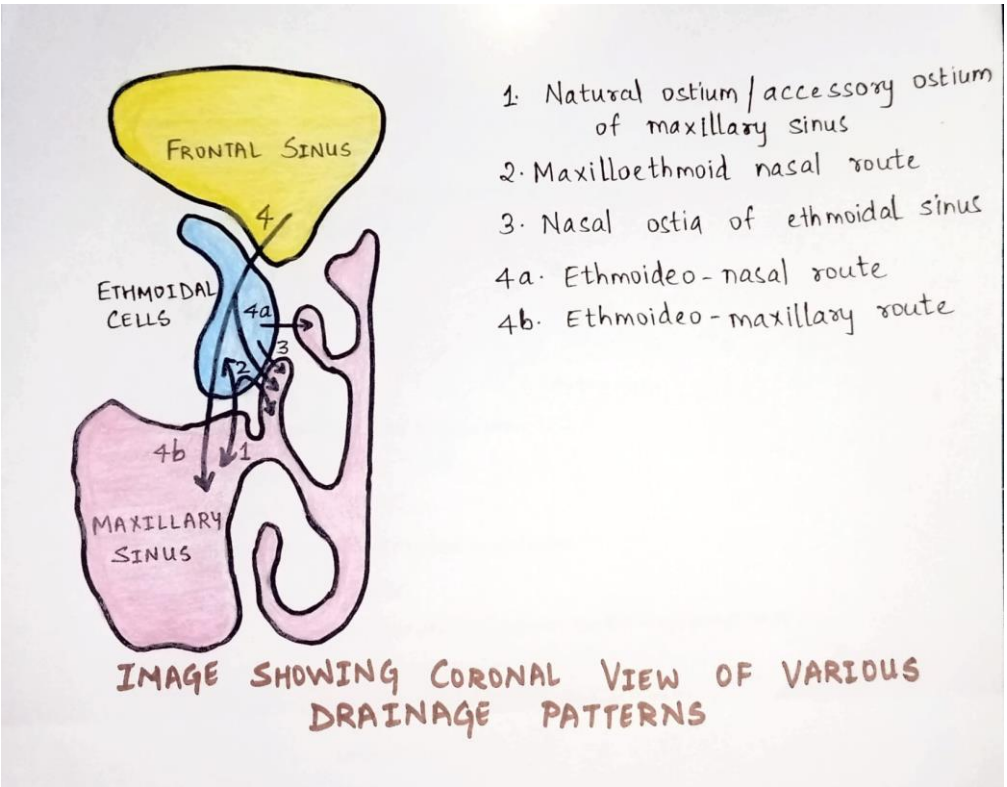
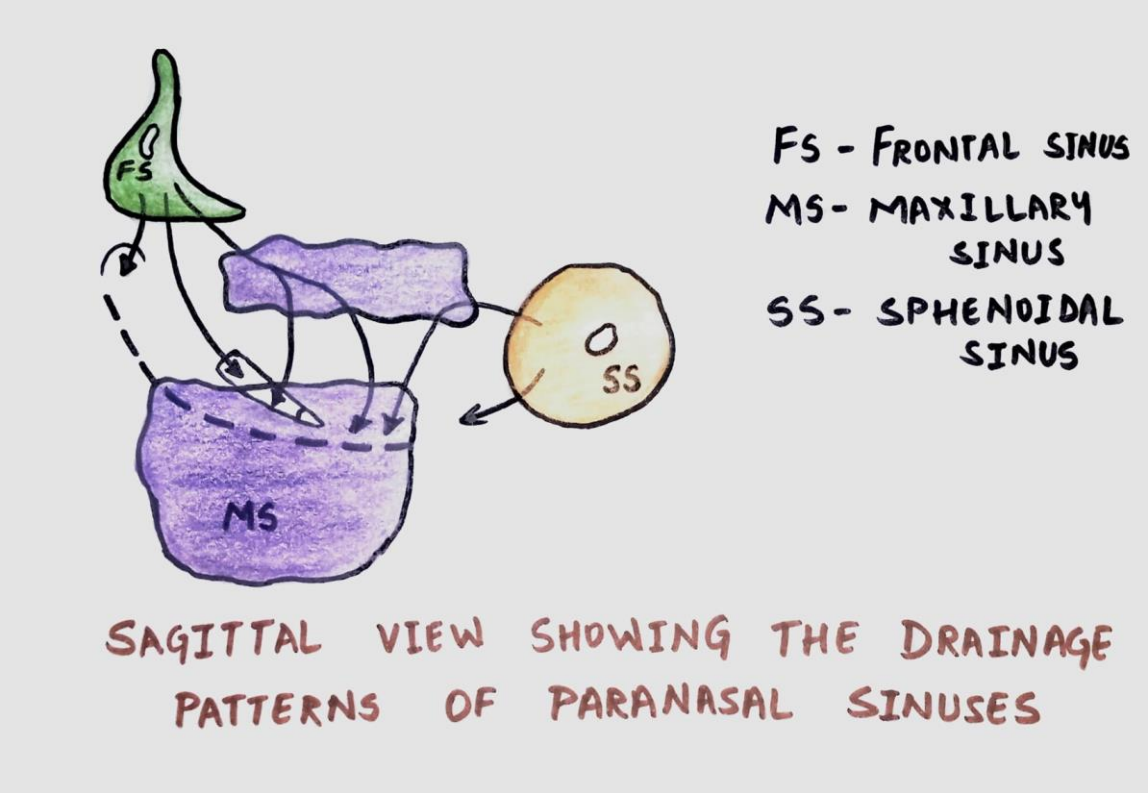


FIGURE 3: Sagittal view of the drainage pathways



IMAGING OF PARANASAL SINUSES AND THE SIGNIFICANCE OF COMPUTED TOMOGRAPHY

Cross-sectional imaging has significantly transformed our approach to and comprehension of the anatomy and disease of paranasal sinuses, as has occurred in all areas of neuroimaging. We have transitioned from conventional film radiographs to advanced high-resolution sinus computerised tomography (CT) and magnetic resonance imaging (MRI), which enhance our ability to visualise normal anatomy and assess pathology.

The preliminary radiological assessment of the nasal cavity and paranasal sinuses is conducted using standard X-ray imaging. This must not be overlooked, as this straightforward approach can reveal the majority of nasal and paranasal sinus pathologies. Nearly all growing or bone-resorbing lesions in the sinuses may be identified, and often, a conclusive diagnosis can be established prior to employing more advanced techniques. If the findings on standard radiography align with uncomplicated allergic or inflammatory sinus conditions and correlate well with clinical observations, additional study is typically unnecessary; this is applicable to the majority of patients evaluated in an ENT clinic. Maxillary and frontal sinusitis occur more commonly than ethmoid sinusitis in clinical settings. Standard paranasal sinus radiographs effectively reveal maxillary or frontal sinus pathology but inadequately characterize ethmoid sinusitis. Otolaryngologists have already acknowledged the significance of the networks between the anterior ethmoid sinus and the frontal and maxillary sinuses (via infundibulum, middle meatus, and frontal recess) in the pathophysiology and management of sinusitis. In 1966, Proctor stated that the ethmoid sinuses are typically central to any issue related to infectious sinusitis. The illness originates there, and a chronic infection in that location typically accounts for the ineffectiveness of treatment aimed at the other paranasal

sinuses. Consequently, it is not unexpected that the clinical and radiologic identification of the interconnections between ethmoid sickness and the afflictions of the adjacent maxillary and frontal sinuses remained largely unexamined until the introduction of computed tomography. [27]

If the plain radiography evidence reveals a growing lesion of the sinus walls or a mass with symptoms implying a more serious condition, additional study via tomography is warranted.
Computerised tomography (CT) now has maximal function in the assessment of sinus disease. It has been relegated to serving merely as a supplementary tool to x-ray during the first assessment. It is effective in indicating the presence of a nasal tumour in conjunction with an opaque sinus, especially regarding the maxillary sinus.
CT findings indicative with chronic sinusitis encompass:
1. Mucosal thickening
2. Opaque air cells
3. Evidence of osseous remodelling
4. Osseous hypertrophy resulting from inflammatory osteitis
5. In severe situations, bony erosion may occur, particularly if accompanied by extensive polyps or mucoceles.[28]

- Significant radiological landmarks should be observed in CT images:
- Prominent structures identifiable in coronal computed tomography of the nasal cavity and paranasal sinuses:
- The interrelation between frontal recess and the sinus
- The olfactory fossa depth correlates positively with the risk of fracture or perforation during surgical procedures, as it increases the distance from the cribriform plate and fovea ethmoidalis.

- Slope, thickness, and irregularities in the elevation of the ethmoid roof:
- Middle turbinate position

- Extent of the maxillary sinus and variations
- Condition of the lamina, its dehiscence,
- The uncinate process
- Additional variants, such as the existence of concha bullosa

Anatomy and variations observed in axial sections:

- The ethmoid cells relative to the sphenoid sinus
- Sphenoid sinus pneumatisation extent and variations like Onodi cells, relation of the carotid artery or optic nerve.
- Openness of the osteomeatal complex
- Nasal septum

CT possesses the advantage of revealing both osseous damage and the level of soft tissue involvement in illness.[29]

AIMS AND OBJECTIVES OF THE STUDY

This study is done to compare the following:

- To assess the height, width and volumetric index of the ethmoid sinus in control and study groups individuals.
- To look for a correlation between the ethmoid sinus measurements in patients of chronic rhinosinusitis and patients without chronic rhinosinusitis.

REVIEW OF LITERATURE

In a cross sectional study done in 2020 Mehrnoosh Mousaviagdas *et al.* calculated ethmoid height and width in normal and CRS individuals in millimetres by drawing three lines. Line A was a horizontal line between two lower orbital holes. Line B was a direct vertical line connecting to line A at the junction of the lateral lamella of the cribriform plate (LLCP) and fovea ethmoidal. Line C was another vertical line perpendicular to line A at the connection place of the cribriform plate to LLCP. Ethmoid height was a subtraction of the length of line C and line B. They also considered the space between the orbit and junction of LLCP and fovea ethmoidalis as the width of the ethmoid sinus. They observed that the ethmoid roof's right side was lower than the left side, irrespective of disease. They also estimated correlation coefficients for rhinosinusitis score and ethmoid sinus height and width, which were not statistically significant.

In 2012, Ahmad R. Sedaghat et al. assessed CT scans to look for heterogeneity within affected sinuses by measuring the average density in Hounsfield Units, the standard deviation, and minimum and maximum densities. The observations suggested that the nature of sinus opacities is related not only to some common underlying pathology but also to factors related to the specific sinus. In addition to sinus-specific properties, they also found that radiographic characteristics such as heterogeneity and, in particular, high-density components correlated among ipsilateral, concomitantly occurring sinus opacities more so than distinctly placed ones. This suggests an anatomic orientation for sinus pathophysiology in CRS.

In 2011, Micheal rieb *et al*. investigated CT scans to look for aspects of laterality of the ethmoid sinus roof and sought to discuss its surgical implications. Three categories were distinguished: (1) the height of the right and left roofs were symmetric, (2) the right roof was lower than the left one, and (3) the left roof was lower than the right one. They observed that almost 1/3rd cases had an asymmetrical ethmoid roof and significantly more asymmetric cases in men than in women.

In 2001 R A Lebowitz *et al*. observed in 9.5%, there was an asymmetry between the height of the fovea ethmoidalis on the right and left sides. Ninety-six patients demonstrated a contour asymmetry with "flattening" of the ethmoid roof on one side (defined as an increase in the angle between the fovea ethmoidalis and the cribriform plate, i.e., the angle of the lateral lamella), 46 on the right and 50 on the left. They concluded that in a patient population with sinus and nasal symptoms, the height and contour of the right and left fovea ethmoidalis were symmetric in less than 50% of individuals highlighting its surgical implications.

In 2014, S. A. Ameye *et al*. sought to look for racial differences in the ethmoid sinus dimensions among adult Nigerians bearing in mind the significance of this sinus in inflammatory pathologies of the other paranasal sinuses and endoscopic sinus surgery. The ethmoid sinus' anterior width was measured in millimetres at a level of the posterior border of the nasal bone. The posterior width was measured at the juncture between the medial orbital wall and anterior wall of the sphenoid. The length was measured from the midpoint of horizontal line at the level of the posterior border of the ethmoid to the midpoint of the anterior wall of the ethmoid for each side. The height of the ethmoid was obtained by measuring the vertical distance from the midpoint of the roof of ethmoid to the horizontal line at the level of

the inferior attachment of the uncinate process that is, the superior border of the inferior turbinate. They found that the dimensions of the ethmoids in the study population who are blacks are consistent with findings in other works done among other races. Type III olfactory fossa type predominated in the study population with the prevalence of anatomical variations being consistent with previous papers.

In 2022, Abdalla, M. A., & Hussien, R. Z. compared the ethmoid sinuses via gross anatomical dissection and CT PNS imaging. They found the mean value for the right ethmoid sinus length in males was 20.3±5.2 mm and was 22.2±4.8 mm on the left side. Whereas, the mean value for the right ethmoid sinus length in females was 21.9±5.6 mm and on the left side the recorded mean value was 25.2±4.7 mm on CT measurements yet they haven't commented on the methodology behind it.

METHODOLOGY

All patients will receive a comprehensive explanation of the technique and their participation in this study, and free consent will be secured.
A comprehensive assessment of the patient will be conducted, concentrating on nasal findings to evaluate the condition of the nose and paranasal sinuses.
CT PNS will be performed on all patients in both the coronal and axial planes.

Patients exhibiting CT findings indicative of chronic rhinosinusitis are classified as cases, whereas those lacking the characteristic CT findings are designated as controls.
The dimensions of the ethmoid sinus, including height, width, and depth of the olfactory fossa, as well as the symmetry of the ethmoid roof, were observed in all cases.
The height of the ethmoid sinus was measured using coronal images from the CT PNS. Three lines were delineated to ascertain ethmoid height.
Line 1 was a horizontal line aligned with the inferior orbital margin. Line 2 was a vertical line connecting perpendicularly to Line 1 at the junction of the lateral lamella of the cribriform plate and fovea ethmoidalis.
Line 3 was an additional vertical line perpendicular to Line 1 at the level of the lateral most part of the cribriform plate. The ethmoid height was determined by the mean of Lines 2 and 3.
The width was assessed by drawing a line from the lamina papyracea to the septum at the height of the cribriform plate.
The olfactory fossa was assessed with Keros' classification.
The anatomical asymmetry and symmetry of the ethmoid sinus are evaluated between the test and control groups to determine a potential association.

FIGURE 4: CT (CORONAL SECTION) WITH ETHMOID HEIGHT MEASUREMENT

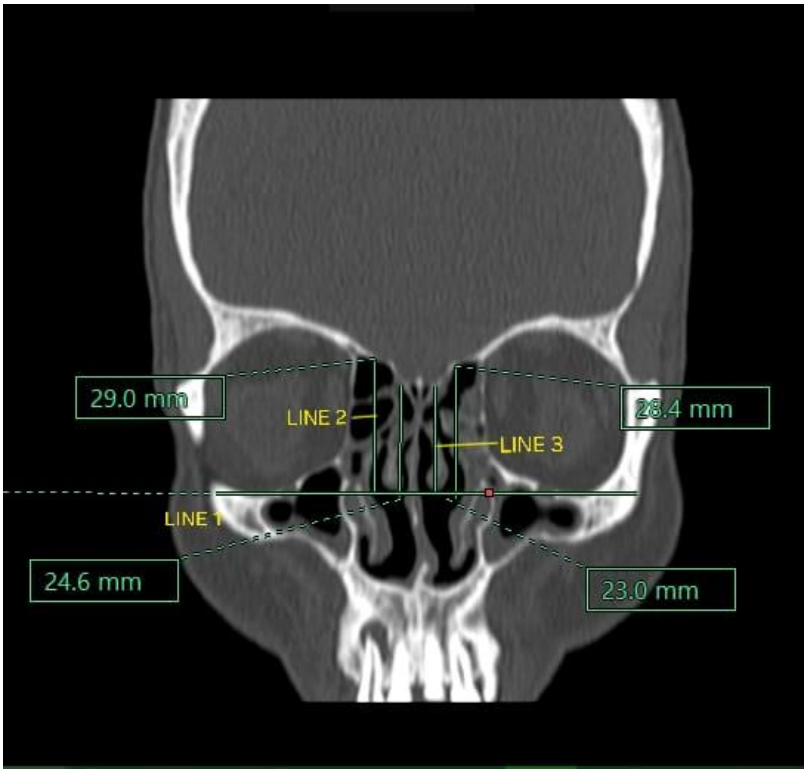
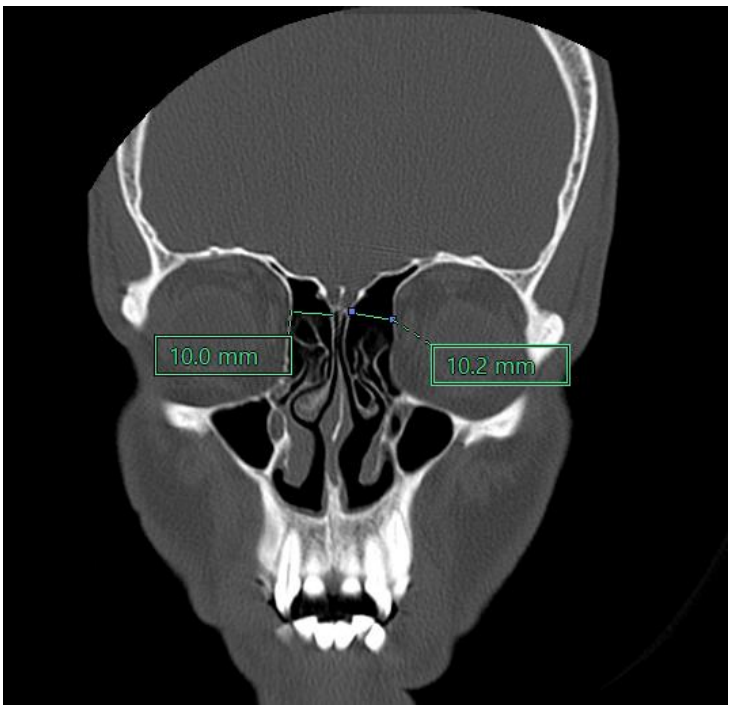


FIGURE 5: CT (CORONAL SECTION) WITH ETHMOID WIDTH MEASUREMENT



INCLUSION CRITERIA

- Patients with sinonasal symptoms of at least three months duration.

EXCLUSION CRITERIA

- Chronic rhinosinusitis with nasal polyps
- Subjects under 18 years of age
- Having other rhinosinusitis (such as allergic or fungal rhinosinusitis), previous surgery of sinus, history of significant head trauma
- CT scans with anatomical variations such as concha bullosa and large Haller cells.

SAMPLE SIZE

Using G*Power ver. 3.1.9.4 software for sample size calculation, The Proportion of type 2 CRS is 31.7%, and Non-CRS is 69.3%. This study requires a total sample size of 96(for each group 48, assuming equal group sizes), so to achieve a power of 94% for detecting a difference in
Proportions: Exact - Proportions: Inequality, two independent groups (unconditional) with a 5% level of significance.

STATISTICAL ANALYSIS:

The data obtained is entered in a Microsoft Excel sheet, and statistical analyses are performed using a statistical package for the social sciences (SPSS) (Version 20). Results are presented as Mean, SD, counts and percentages, and diagrams. For normally distributed
Continuous variables between the two groups will be compared using an independent sample t-test. For not normally distributed variables, the Mann-Whitney U test is used. Categorical variables between the two groups are compared using the Chi-square test/Fisher's exact test. If $p<0.05$ will be considered statistically significant. All statistics are performed in two-tailed

RESULTS AND OBSERVATION

Table 1: DISTRIBUTION ACCORDING TO AGE

Out of 96 patients, 8(8.3%) were below 20yrs of age, 30(31.3%) were between 20-29 years, 30(31.3%) were between 30-39 years, 22(22.9%) were between 40-49 years, 5(5.2%) were between 50-59 years and only 1(1.0%) patient was above 60 years.

The study showed that maximum number of patients were between 20-40 years

Age	Control	Cases	Total	Chi square test	Significant value
< 20	7	1	8	10.148	P=0.071
	14.6%	2.1%	8.3%		
20 - 29	13	17	30		
	27.1%	35.4%	31.3%		
30 - 39	11	19	30		
	22.9%	39.6%	31.3%		
40 - 49	12	10	22		
	25.0%	20.8%	22.9%		
50 - 59	4	1	5		
	8.3%	2.1%	5.2%		
60+	1	0	1		
	2.1%	0.0%	1.0%		
Total	48	48	96		
	100.0%	100.0%	100.0%		
Statistically Insignificant					

Graph 1: BAR GRAPH DEPICTION OF AGE DISTRIBUTION

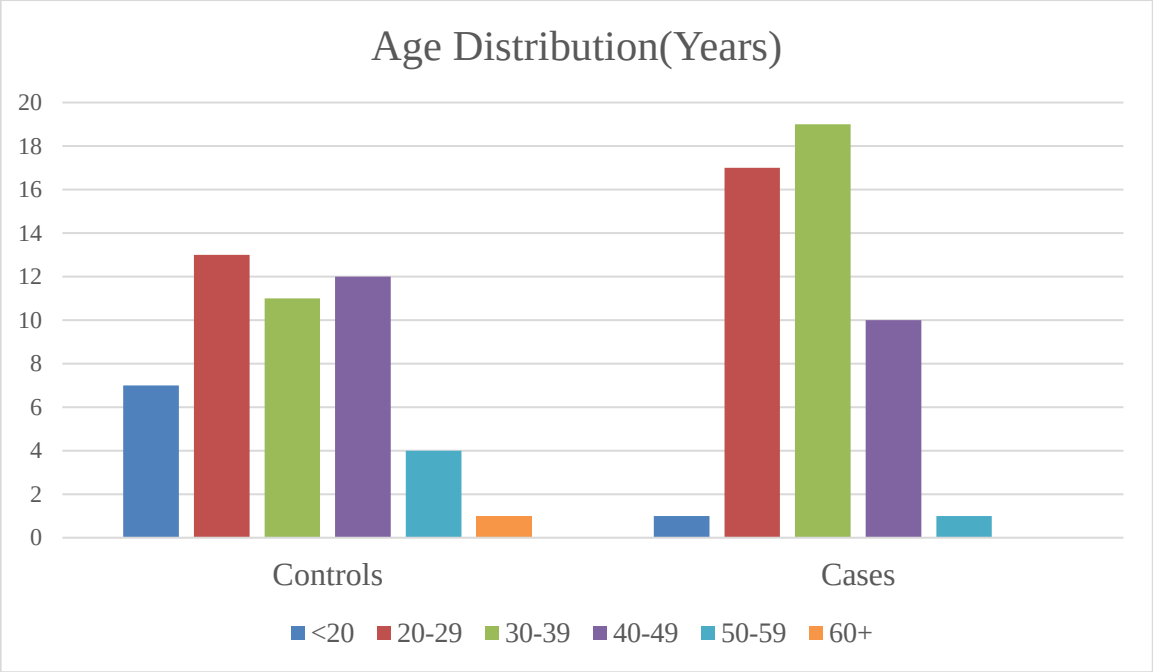


Table 2: DISTRIBUTION ACCORDING TO SEX

Out of 48 controls, 26(54.2%) were males and 22(45.8%) were females.

Out of 48 cases, 31(64.6%) were males and 17(35.4%) were females.

Sex	Controls	Cases	Total	Chi Square Test	Significant Value
Female	22	17	39	1.080	0.299
	45.8%	35.4%	40.6%		
Male	26	31	57		
	54.2%	64.6%	59.4%		
Total	48	48	96		
	100.0%	100.0%	100.0%		
Statistically Insignificant					

Graph 2: BAR GRAPH DEPICTING SEX DISTRIBUTION

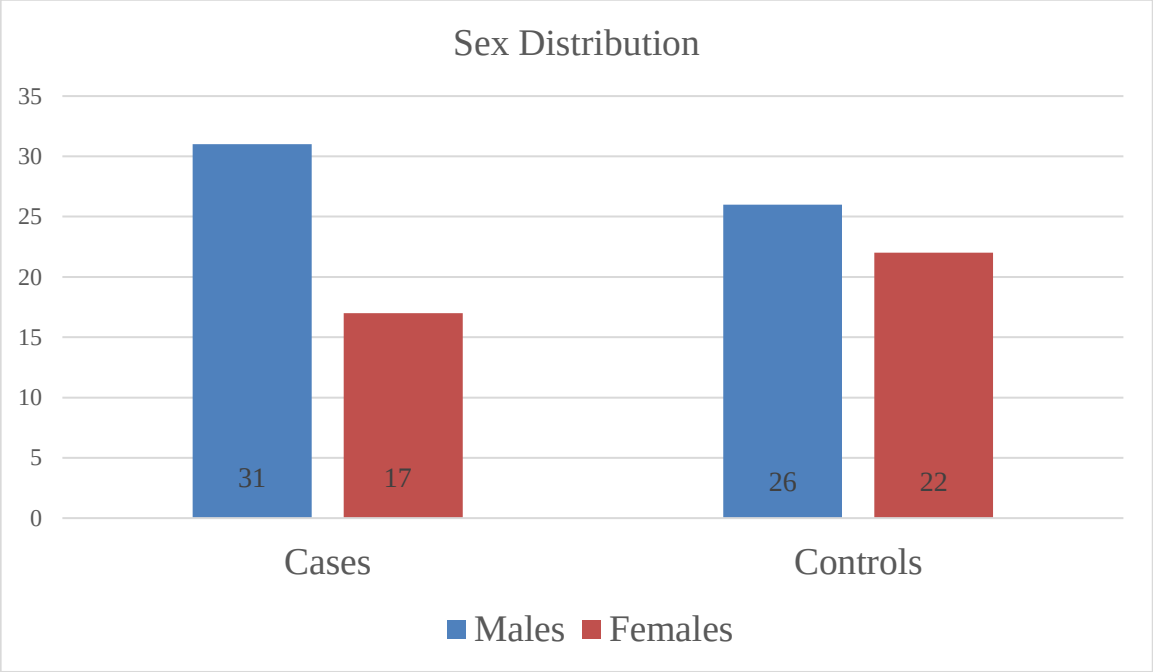
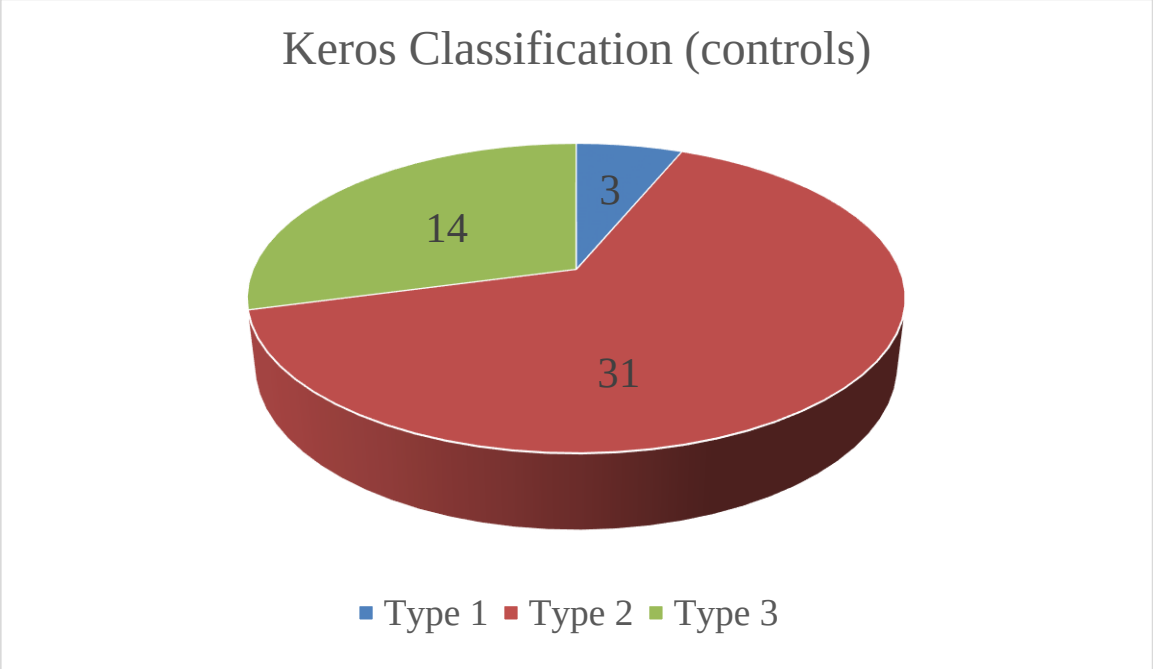


Table 3: DISTRIBUTION ACCORDING TO KEROS' CLASSIFICATION

The depth of olfactory fossa by Keros' classification was measure in millimeters in both normal and diseased individuals. The study showed that majority of the cases (71.9%) had a Type 2 Olfactory fossa followed by Type 3 seen in 19.8% of the population and lastly Type 1 seen in 8.3%.

		Control	Cases	Total	Chi Square Test	Significant Value
Keros Classification	Type 1 (1-3mm)	3	5	8	5.47	0.065
		6.3%	10.4%	8.3%		
	Type 2 (4-7mm)	31	38	69		
		64.6%	79.2%	71.9%		
	Type 3 (8-16mm)	14	5	19		
		29.2%	10.4%	19.8%		
Total		48	48	96		
		100.0%	100.0%	100.0%		
Statistically Insignificant						

Graph 3: PIE CHART DEPICTING DISTRIBUTION OF CONTROLS ACCORDING TO KEROS' CLASSIFICATION



Graph 4: PIE CHART DEPICTING DISTRIBUTION OF CASES ACCORDING TO KEROS' CLASSIFICATION

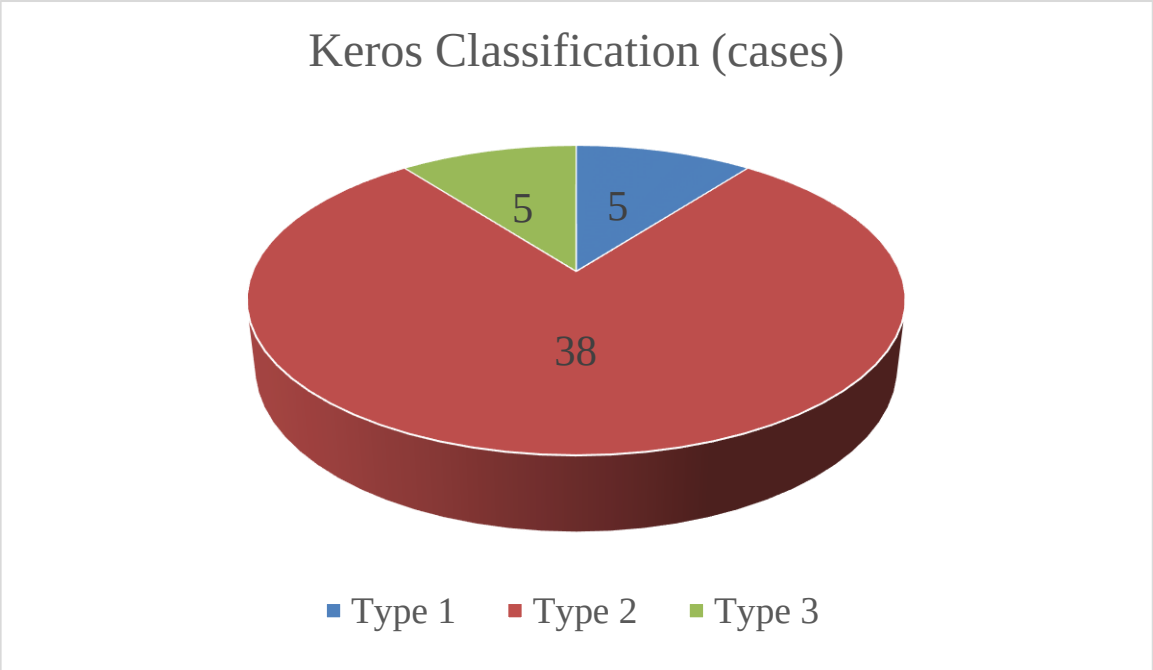
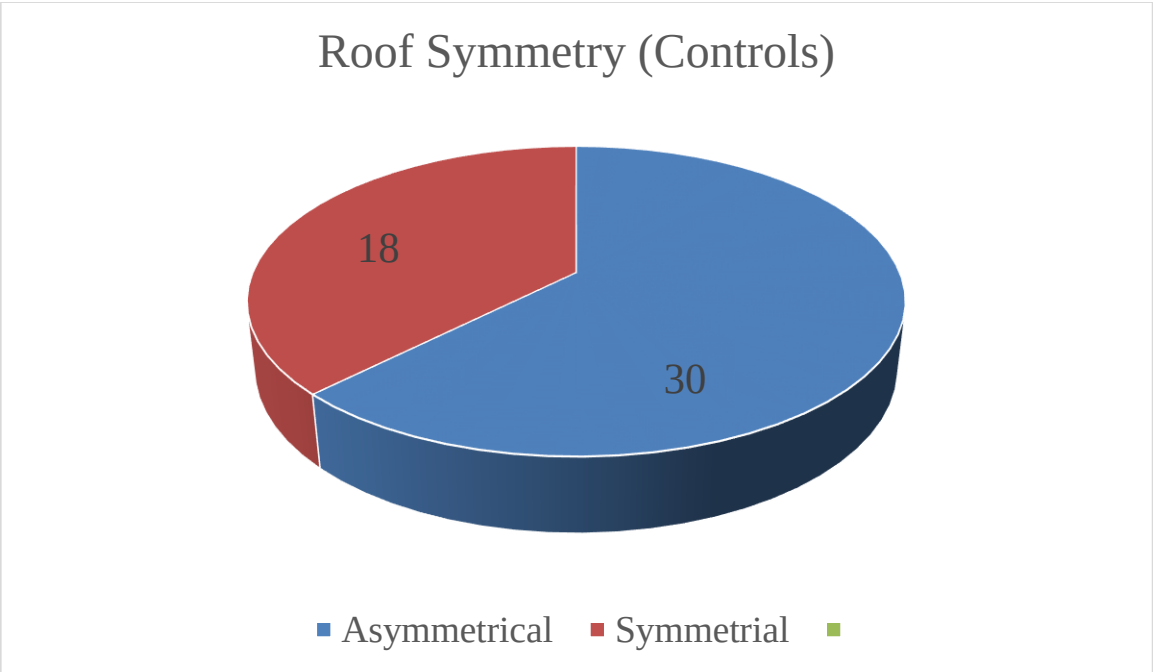


Table 4: DISTRIBUTION ACCORDING TO SYMMETRY OF ETHMOID ROOF

In the study population, the roof was symmetrical in 18 (37.5%) individuals in the control group as compared to 11 (22.9%) in the case group, although this association was not statistically significant.

		Control	Cases	Total	Chi Square Test	Significant value
Roof Symmetry	Asymmetrical	30	37	67	2.421	0.120
		62.5%	77.1%	69.8%		
	Symmetrical	18	11	29		
		37.5%	22.9%	30.2%		
Total		48	48	96		
		100.0%	100.0%	100.0%		
Statistically Insignificant						

Graph 5: PIE CHART DEPICTING DISTRIBUTION OF CONTROLS ACCORDING TO ROOF SYMMETRY



Graph 6: PIE CHART DEPICTING DISTRIBUTION OF CASES ACCORDING TO ROOF SYMMETRY

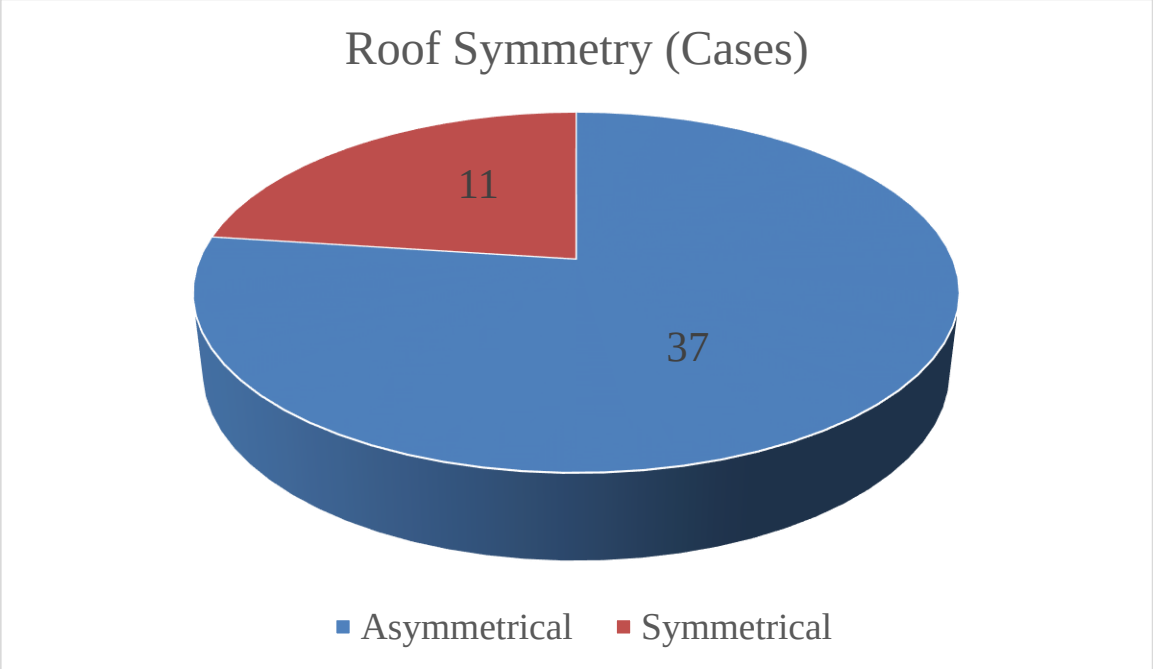


Table 5: DISTRIBUTION ACCORDING ETHMOID SINUS DIMENSIONS (HEIGHT AND WIDTH)

Among the 48 controls, the mean right ethmoid sinus height was 19.302, and the mean left ethmoid sinus height was 19.371. Among the 48 cases, the mean right ethmoid sinus height was 17.406 and the mean left ethmoid sinus height was 17.419. The observed difference was statistically significant (p= 0.001)

Among the 48 controls, the mean right ethmoid sinus width was 10.1275 and the mean left ethmoid sinus with was 10.0331. Among the 48 cases, the mean right ethmoid sinus width was 9.0167 and the mean left ethmoid sinus width was 9.0396. The observed difference was statistically significant (p= 0.000 and p=0.002)

Measurement (in mm)	Group	Number	Mean	Std. Deviation	Mann-Whitney U Test	Asymptotic significance
Right Ethmoid Sinus Height	Control	48	19.302	2.9294	679.500	0.001
	Cases	48	17.406	1.9912		
Left Ethmoid Sinus Height	Control	48	19.371	3.2319	716.000	0.001
	Cases	48	17.419	1.9105		
Right Ethmoid Sinus Width	Control	48	10.1275	2.18310	642.000	0.000
	Cases	48	9.0167	1.03786		
Left Ethmoid Sinus Width	Control	48	10.0331	2.39891	725.000	0.002
	Cases	48	9.0396	1.04489		

Table 6: DISTRIBUTION ACCORDING TO HEIGHT SYMMETRY

Out of 48 cases, 11 had symmetrical ethmoid sinus height and out of 48 controls, 14 had symmetrical ethmoid sinus height. Using chi - square as the test of significance, p - value of 0.485 was obtained which was not significant

		Control	Cases	Total	Chi square Test	Asymptotic Significance
Height	Symmetrical	14	11	25	0.487	0.485
		29.2%	22.9%	26.0%		
	Asymmetrical	34	37	71		
		70.8%	77.1%	74.0%		
Total		48	48	96		
		100.0%	100.0%	100.0%		
Statistically insignificant						

Graph 7: BAR GRAPH DEPICTION OF DISTRIBUTION ACCORDING TO HEIGHT SYMMETRY

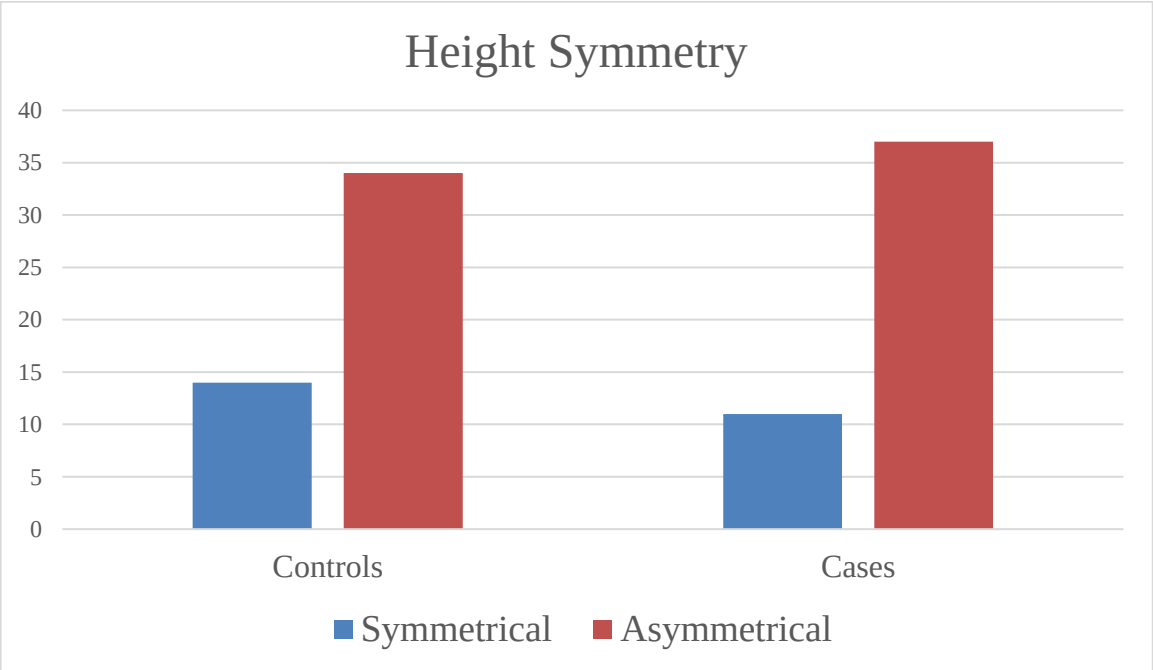
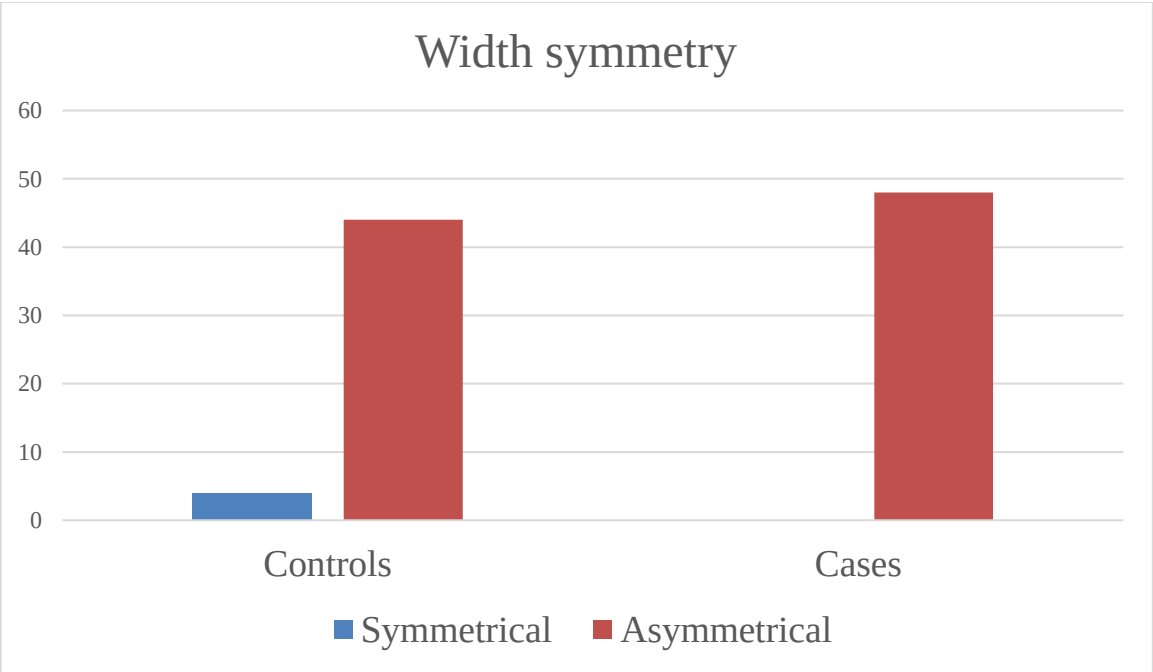


Table 7: DISTRIBUTION ACCORDING TO WIDTH SYMMETRY

Out of 48 cases, none had symmetrical ethmoid sinus width and out of 48 controls, 4 had symmetrical ethmoid sinus width. Using Chi-square as the test of significance, p - the value of 0.041 was obtained, which was significant.

		Control	Cases	Total	Chi square Test	Asymptotic Significance
Width	Symmetrical	4	0	4	4.174	0.041
		8.3%	0.0%	4.2%		
	Asymmetrical	44	48	92		
		91.7%	100.0%	95.8%		
Total		48	48	96		
		100.0%	100.0%	100.0%		
Statistically significant						

Graph 8: BAR GRAPH DEPICTION OF DISTRIBUTION ACCORDING TO WIDTH SYMMETRY



DISCUSSION

Chronic rhinosinusitis is a chronic condition of the nose and paranasal sinus system associated with significant morbidity. The etiology behind chronic rhinosinusitis is multifactorial with multiple complex anatomical and physiological influences to it. Computed tomography of the paranasal sinuses acts as a guide for understanding the anatomical basis for etiopathogenesis, for disease diagnosis and also as a roadmap while planning for surgery. It has the advantage of showing both bone destruction and the soft tissue extent of disease.

In this study, using CT PNS images, a total of 96 participants, equally divided into normal and sinusitis groups were evaluated. The ethmoid sinuses was evaluated for dimensions i.e. height and width, their symmetry and the roof asymmetry and its correlation with chronic rhinosinusitis among the participants. Note was made of the olfactory fossa depth using Keros' classification in each of them.

The mean age of the participants in the control group was 34.8±11 years, while in the cases group it was 31.3±8.8 years. The age distribution across different age group was statistically insignificant (0.071) although the maximum number was seen between 20-40 years. Sex distribution was also comparable between the 2 groups (p=0.299), supporting the validity of randomization and minimizing potential confounding factors.

Additionally, Keros' classification showed that the majority of the cases had a type 2 olfactory fossa (71.9%) while type 3 was seen in 19.8% and type 1 was seen in 8.3%. The distribution between cases and controls was similar with no significant association (p=0.065). Our findings differ with other studies such as that by Ameye et al (2014) who found a higher prevelance of Keros type 3 (71.3%). However, the lack of significance between Keros classification and CRS suggests that the depth alone may not be a primary risk factor for disease development. Instead, factors such as ethmoid sinus dimensions and ventilation pathways may play a more substantial role.

Symmetry of the ethmoid roof was also assessed and it was seen that asymmetrical ethmoid roof was more commonly seen in CRS cases (77.1%) than in control (62.5%), though this was not statistically significant (p=0.120). In comparison, Reiß et al. (2011) found that 31% of patients in their study had an asymmetrical roof, with more cases occurring on the right side where as Goytia et al (2017) found asymmetry in 97% of the cases. But these studies have highlighted ethmoid roof asymmetry as a potential risk factor for surgical complications and not necessarily as a factor for CRS etiopathogenesis which was in line with our findings. On the other hand studies such as that by Ameye et al. (2014) have measured the average height and width but have not analyzed the relationship between sinus size and

CRS. Their findings could suggest that there may be ethnic or regional variations in ethmoid sinus dimensions, which could affect susceptibility to sinus disease.

This study found a significant reduction in ethmoid sinus height and width in CRS patients as compared to normal cases. This could suggest that patients with a smaller ethmoid sinuses may be more predisposed to chronic inflammation, possibly due to restricted ventilation and impaired mucociliary clearance. These findings contrast with those of Mousaviagdas et al. (2020) who analyzed 422 patients and found no statistically significant correlation between ethmoid sinus height and width and the presence of CRS which was differing from our results. This could be attributed to differences in population demographics, measurement techniques or sample selection criteria.

When we compared the height and width symmetry between the two groups, we found no co-relation between height asymmetry and CRS (p=0.485). However, width symmetry showed a statistically significant association ($p = 0.041$), suggesting that asymmetrical ethmoid sinus width may have a role in CRS pathophysiology. This, however, was in contrast to findings reported by other studies such as that by Mousaviagdas et al. (2020). Findings by Bulescu et al (2017) supports the idea that ethmoid sinus volume is highly variable which may contribute to different findings across different studies. While volumetric analysis provides a more comprehensive assessment of sinus

dimensions, its findings further highlight the complexity of CRS pathophysiology, suggesting that factors beyond mucosal inflammation, local immune response and environmental exposures.

The finding of significant asymmetry in ethmoid sinus width among CRS patients may also have implications for disease progression and treatment. Asymmetrical sinus morphology could influence the direction and time taken for mucus drainage and predispose certain individuals to unilateral or asymmetric sinus disease. This emphasizes the need for individualized treatment approaches in CRS patients with anatomical variations.

The findings of this study suggest that smaller ethmoid sinuses may predispose individuals to CRS due to narrower drainage pathways and higher susceptibility to obstruction. Another factor could be the variation of disease progression within the CRS subtypes. Anatomical variations may play a bigger roles in certain subtypes, such as obstructive CRS, but not in others with a stronger inflammatory or infectious component. This has implications in ESS where in patients may require more precise surgical planning to avoid complications. And individuals with narrow ethmoid sinuses could potentially benefit from early intervention strategies such as nasal irrigation or steroid therapy to prevent disease progression.

CONCLUSION

This study investigated the relationship between ethmoid sinus dimensions and chronic rhinosinusitis using computed tomography (CT). Our findings revealed a significant reduction in ethmoid sinus height and width in CRS patients compared to control, suggesting that smaller ethmoid sinuses may contribute to disease development by predisposing individuals to ventilation impairment and mucociliary dysfunction. However, ethmoid roof asymmetry and Keros' classification did not show a statistically significant association with CRS, indicating that these anatomical variations are not primary risk factors. Our results emphasize the role of ethmoidal sinus dimensions and highlight the clinical implications of this in surgical planning of Chronic Rhinosinusitis.

LIMITATIONS

This study is limited by its small sample size and single center design, which may affect generalization. Volumetric CT analysis was not performed and measurement variability could introduce minor differences and inconsistencies. Additionally, ethnic and geographic variations in anatomy were not accounted for. Future research can focus on incorporating larger multiethnic samples and longitudinal follow-up to better understand the role of ethmoid sinus dimensions in CRS.

SUMMARY

The study "RADIOLOGICAL MEASUREMENT OF ETHMOID SINUS DIMENSIONS AND ITS CORRELATION WITH CHRONIC RHINOSINUSITIS" was done in Shri B M Patil Medical College, Hospital and Research Centre, Vijayapura was done during the period of February 2023 to January 2025

A total of 96 patients were selected based on the inclusion criteria for the study to find out the CT findings of the ethmoid sinuses and compare them between normal and sinusitis individuals. The following observations were noted:

1. Of the 96 individuals, there were 57 males and 39 females.
2. Of the 96 individuals, the maximum number of patients were between 20-40 years.
3. Of the 96 individuals, 71.9% had a Keros Type 2 olfactory fossa but it was not a statistically significant co-relation among the case and control groups (p=0.065).
4. Of the 96 individuals, 69.8% cases had an asymmetrical ethmoid roof but it was not a statistically significant co-relation among the case and control groups (p=0.120).
5. The bilateral ethmoid sinus dimensions (height and width) were significant smaller in cases as compared to controls.
6. The height symmetry compared between the two groups was not statistically significant (p=0.487) suggesting that height asymmetry may not play a role in CRS etiopathogenesis.

7. The width symmetry compared between the two groups was statistically significant (p=0.041) suggesting that width asymmetry may play a role in CRS etiopathogenesis.

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ANNEXURE 1

ETHICAL CLEARANCE CERTIFICATE

Azadi Ka Amrit Mahotsav

BLDE

(DEEMED TO BE UNIVERSITY)

Declared as Deemed to be University u/s 3 of UGC Act, 1956

Accredited with 'A' Grade by NAAC (Cycle-2)

The Constituent College

SHRI B. M. PATIL MEDICAL COLLEGE, HOSPITAL & RESEARCH CENTRE, VIJAYAPURA

BLDE (DU)/IEC/ 983/2022-23 10/4/2023

INSTITUTIONAL ETHICAL CLEARANCE CERTIFICATE

The Ethical Committee of this University met on **Saturday, 18th March, 2023 at 11.30 a.m. in the CAL Laboratory, Dept. of Pharmacology,** scrutinizes the Synopsis/ Research Projects of Post Graduate Student / Under Graduate Student /Faculty members of this University /Ph.D. Student College from ethical clearance point of view. After scrutiny, the following original/ corrected and revised version synopsis of the thesis/ research projects has been accorded ethical clearance.

TITLE: "RADIOLOGICAL MEASUREMENT OF ETHMOID SINUS DIMENSIONA AND ITS CORRELATION WITH CHRONIC RHINOSINUSITIS".

NAME OF THE STUDENT/PRINCIPAL INVESTIGATOR: DR.KOTHAVALE SAGARIKA.

NAME OF THE GUIDE: DR. H.T.LATHADEVI. PROFESSOR AND HOD, DEPT. OF OTORHINOLARYNGOLOGY.

Dr. Santoshkumar Jeevangi
Chairperson
IEC, BLDE (DU),
VIJAYAPURA

Chairman,
Institutional Ethical Committee,
BLDE (Deemed to be University)
Vijayapura

Dr.Akram A. Naikwadi
Member Secretary
IEC, BLDE (DU),
VIJAYAPURA

MEMBER SECRETARY
Institutional Ethics Committee
BLDE (Deemed to be University)
Vijayapura-586103, Karnataka

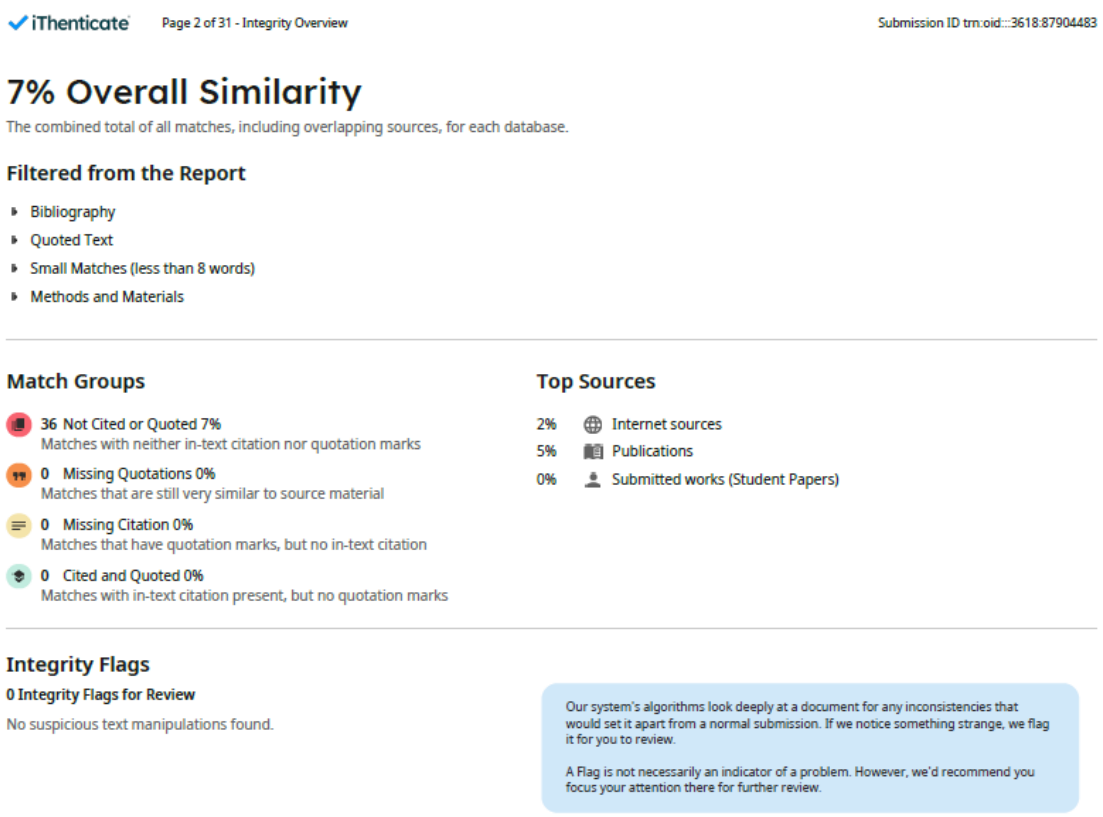
Following documents were placed before Ethical Committee for Scrutinization.

- Copy of Synopsis/Research Projects
- Copy of inform consent form
- Any other relevant document

Smt. Bangaramma Sajjan Campus, B. M. Patil Road (Sholapur Road), Vijayapura - 586103, Karnataka, India.
BLDE (DU): Phone: +918352-262770, Fax: +918352-263303, Website: www.bldedu.ac.in, E-mail:office@bldedu.ac.in
College: Phone: +918352-262770, Fax: +918352-263019, E-mail: bmpmc.principal@bldedu.ac.in

ANNEXURE 2

PLAGIARISM CERTIFICATE



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ANNEXURE 3

INFORMED CONSENT

BLDE (DEEMED TO BE UNIVERSITY)

SHRI B M PATIL MEDICAL COLLEGE HOSPITAL AND RESEARCH CENTRE, VIJAYAPURA- 586103

TITLE OF THE PROJECT :

RADIOLOGICAL MEASUREMENT OF ETHMOID SINUS DIMENSIONS AND ITS CORRELATION WITH THE OCCURRENCE OF CHRONIC RHINOSINUSITIS

PG STUDENT - DR. KOTHAVALE SAGARIKA

DEPARTMENT OF OTORHINOLARYNGOLOGY

PG GUIDE - DR.H.T.LATHADEVI

PROFESSOR AND HEAD OF DEPARTMENT

SHRI B. M. PATIL MEDICAL COLLEGE HOSPITAL AND RESEARCH VIJAYAPURA –586103

PG CO-GUIDE - DR.RAVIKUMAR

ASSOCIATE PROFESSOR

SHRI B. M. PATIL MEDICAL COLLEGE HOSPITAL AND RESEARCH VIJAYAPURA –586103

All aspects of this consent form are explained to the patient in the language they understand.

PURPOSE OF RESEARCH

I, DR.KOTHAVALE SAGARIKA, have been informed about this study. I have also been given a free choice of participation in this study.

PROCEDURE:

I am aware that in addition to routine care received, the investigator will ask me a series of questions. I have been asked to undergo the necessary investigations and treatment to help the investigator in this study.

1) RISK AND DISCOMFORTS

I understand I may experience pain and discomfort during the examination or treatment. This is mainly the result of my condition, and the procedure of this study is not expected to exaggerate these feelings associated with the usual course of treatment.

2) BENEFITS:

I understand that my participation in this study will help improve the patient's survival and outcome.

3) CONFIDENTIALITY:

I understand that the medical information produced by this study will be part of Hospital records and subject to confidentiality and privacy regulation.

Information of a sensitive personal nature will not be a part of the medical records. However, it will be stored in the investigator's research file and identified only by a code number. The code key connecting the name to numbers will be kept in a separate location. If the data are used for publication in the medical literature or for teaching purposes, no name will be used, and other identifiers such as photographs and audio or videotapes will be used only with my special written permission. I understand that I may see the photographs and videotapes and hear the audiotapes before giving this permission.

4) REQUEST FOR MORE INFORMATION:

I understand that I may ask more questions about the study at any time. DR KOTHAVALE SAGARIKA is available to answer my questions or concerns. I understand that I will be informed of any significant new findings discovered during the course of the study, which might influence my continued participation.

If, during the study or later, I wish to discuss my participation in or concerns regarding this study with a person not directly involved, I am aware that the social worker of the hospital is available to talk with me. A copy of this consent form will be given to me to keep for careful reading.

5) REFUSAL OR WITHDRAWAL OF PARTICIPATION:

I understand that my participation is voluntary and that I may refuse to participate or may withdraw the consent and discontinue participation in the study at any time without prejudice to my present or future care at this hospital. I also understand that DR KOTHAVALE SAGARIKA may terminate my participation in the study after she has explained the reasons for doing so and has helped arrange for my continued care by my own physician or physical therapist if this is appropriate.

6) INJURY STATEMENT:

I understand that in the unlikely event of injury to me resulting directly from my participation in this study if such injury were reported promptly, the appropriate treatment would be available to me, but no further compensation would be provided. I understand that by my agreement to participate in this study, I am not waiving any of my legal rights.

I have explained to _____the purpose of the research, the procedures required and the possible risks and benefits to the best of my ability in patient's own language.

_____ _____

Dr. KOTHAVALE SAGARIKA (Investigator) Date

STUDY SUBJECT CONSENT STATEMENT

I confirm that DR. KOTHAVALE SAGARIKA has explained to me the purpose of the research, the study procedures that I will undergo, and the possible risks and discomforts as well as benefits that I may experience in my own language. I have read and understand this consent form. Therefore, I agree to consent to participate as a subject in this research project.

_____ _____

Participant / Guardian Date

_____ _____

Witness to signature Date

B.L.D.E (DEEMED TO BE UNIVERSITY) ಶ್ರೀ ಬಿ.ಎಂ.ಪಟ್ಟೀಲ್ ಮೆಡಿಕಲ್ ಕಾಲೇಜು, ಆಸ್ಪತ್ರೆ ಮತ್ತು ಸಂಶೋಧನಾ ಕೇಂದ್ರ, ವಿಜಯಪುರ-586103

ಪ್ರಬಂಧ/ಸಂಶೋಧನೆಯಲ್ಲಿ ಪಾಲ್ಗೊಳ್ಳಲು ಮಾಹಿತಿ ಪಡೆದ ಸಮ್ಮತಿ

ನಾನು, ಕೆಳಗಿನವರು_____ ಸಹಿಯಿಟ್ಟವರು, ಮಗ/ಮಗಳು/ಪತ್ನಿಯ _____ ವಯಸ್ಸು _____ವರ್ಷಗಳು, ಸಾಮಾನ್ಯವಾಗಿ ನಿವಾಸಿಸುವ ಸ್ಥಳದ ಹೆಸರು_____, ಇಲ್ಲಿ ಹೇಳಿದ್ದೇನೆ/ಘೋಷಿಸುತ್ತೇನೆ ಡಾಕ್ಟರ್ ಹೆಸರು_____ ಅವರು ಆಸ್ಪತ್ರೆ ಹೆಸರು_____ ಅವರು ನನ್ನನ್ನು ಪೂರ್ಣವಾಗಿ ಪರೀಕ್ಷಿಸಿದರು ದಿನಾಂಕದಲ್ಲಿ_____ ಸ್ಥಳ ಹೆಸರು_____ ಮತ್ತು ನನಗೆ ನನ್ನ ಭಾಷೆಯಲ್ಲಿ ವಿವರಿಸಲಾಗಿದೆ ನಾನು ಒಂದು ರೋಗ (ಸ್ಥಿತಿ) ಅನುಭವಿಸುತ್ತಿದ್ದೇನೆ. ಮುಂದುವರಿದು ಡಾಕ್ಟರ್ ನನಗೆ ತಿಳಿಸಿದ್ದಾರೆ ಅವರು ಒಂದು ಪದ್ಧತಿ/ಸಂಶೋಧನೆ ನಡೆಸುತ್ತಿದ್ದಾರೆ ಶೀರ್ಷಿಕೆಯುಳ್ಳ_____ ಡಾಕ್ಟರ್_____ ಮಾರ್ಗದರ್ಶನದಲ್ಲಿ ನನ್ನ ಪಾಲ್ಗೊಳ್ಳುವಿಕೆಯನ್ನು ಕೇಳಿದ್ದಾರೆ ಅಧ್ಯಯನದಲ್ಲಿ.

ಡಾಕ್ಟರ್ ನನಗೆ ಇದನ್ನು ಕೂಡಾ ತಿಳಿಸಿದ್ದಾರೆ ಈ ಕ್ರಮದ ನಡೆವಲ್ಲಿ ಪ್ರತಿಕೂಲ ಫಲಿತಾಂಶಗಳನ್ನು ಎದುರಿಸಬಹುದು. ಮೇಲೆ ಹೇಳಿದ ಪ್ರಕಟಣೆಗಳಲ್ಲಿ, ಅಧಿಕಾಂಶವು ಚಿಕಿತ್ಸಿಸಬಹುದಾದರೂ ಅದನ್ನು ನಿರೀಕ್ಷಿಸಲಾಗುತ್ತಿಲ್ಲ ಆದ್ದರಿಂದ ನನ್ನ ಸ್ಥಿತಿಯ ಹಿರಿದಾಗುವ ಅವಕಾಶವಿದೆ ಮತ್ತು ಅಪರೂಪದ ಸಂದರ್ಭಗಳಲ್ಲಿ ಅದು ಮರಣಕಾರಕವಾಗಿ ಪರಿಣಮಿಸಬಹುದು ಹೊಂದಿದ ರೋಗನಿರ್ಧಾರ ಮತ್ತು ಯಥಾಶಕ್ತಿ ಚಿಕಿತ್ಸೆ ಮಾಡಲು ಹೊಂದಿದರೂ. ಮುಂದುವರಿದು ಡಾಕ್ಟರ್ ನನಗೆ ತಿಳಿಸಿದ್ದಾರೆ ನನ್ನ ಪಾಲ್ಗೊಳ್ಳುವಿಕೆ ಈ ಅಧ್ಯಯನದ ಫಲಿತಾಂಶಗಳ ಮೌಲ್ಯಮಾಪನದಲ್ಲಿ ಸಹಾಯಕವಾಗುತತ್ತದೆ ಇತರ ಸಮಾನ ಪ್ರಕರಣಗಳ ಚಿಕಿತ್ಸೆಗೆ ಉಪಯುಕ್ತ ಉಲ್ಲೇಖವಾಗಿದೆ, ಮತ್ತು ನಾನು ಅನುಭವಿಸುವ ರೋಗದಿಂದ ವಿಮುಕ್ತಿ ಅಥವಾ ಗುಣಮುಖಗೊಳ್ಳುವಲ್ಲಿ ನನಗೆ ಪ್ರಯೋಜನವಾಗಬಹುದು.

ಡಾಕ್ಟರ್ ನನಗೆ ಇದನ್ನು ಕೂಡಾ ತಿಳಿಸಿದ್ದಾರೆ ನನ್ನಿಂದ ನೀಡಿದ ಮಾಹಿತಿ, ಮಾಡಿದ ಪರಿಶೀಲನೆಗಳು / ಫೋಟೋಗ್ರಾಫ್‌ಗಳು / ವೀಡಿಯೋ ಗ್ರಾಫ್‌ಗಳು ನನ್ನ ಮೇಲೆ ತೆಗೆದುಕೊಳ್ಳಲಾಗುವ ಅನ್ವೇಷಕರು ರಹಸ್ಯವಾಗಿ ಇಡುವರು ಮತ್ತು ನಾನು ಅಥವಾ ನನಗೆ ಕಾನೂನು ದೃಷ್ಟಿಯಲ್ಲಿ ಸಂಬಂಧಿತrannu ಹೊರತುಪಡಿಸಿ ಇತರ ವ್ಯಕ್ತಿಯಿಂದ ಮೌಲ್ಯಮಾಪನ ಮಾಡಲಾಗುವುದಿಲ್ಲ. ಡಾಕ್ಟರ್ ನನಗೆ ತಿಳಿಸಿದ್ದಾರೆ ನನ್ನ ಪಾಲ್ಗೊಳ್ಳುವಿಕೆ ಶುದ್ಧವಾಗಿ ಸ್ವೇಚ್ಛಾಯಿತ, ನನ್ನಿಂದ ನೀಡಿದ ಮಾಹಿತಿಯ ಆಧಾರದ ಮೇಲೆ, ಚಿಕಿತ್ಸೆ / ಅಧ್ಯಯನದ ಸಂಬಂಧದಲ್ಲಿ ರೋಗನಿರ್ಧಾರ, ಚಿಕಿತ್ಸೆಯ ವಿಧಾನ, ಚಿಕಿತ್ಸೆಯ ಫಲಿತಾಂಶ ಅಥವ ಆ ಭವಿಷ್ಯದ ಪ್ರವೃತ್ತಿಗಳು ಬಗ್ಗೆ ಯಾವುದೇ ಸ್ಪಷ್ಟತೆ ಕೇಳಬಹುದು. ಅದೇ ಸಮಯದಲ್ಲಿ ನನಗೆ ತಿಳಿಸಲಾಗಿದೆ ನಾನು ಯಾವುದೇ ಸಮಯದಲ್ಲಿ ಈ ಅಧ್ಯಯನದಲ್ಲಿ ನನ್ನ ಪಾಲ್ಗೊಳ್ಳುವಿಕೆಯನ್ನು ನಿಲ್ಲಿಸಬಹುದು ನಾನು ಬಯಸಿದರೆ ಅಥವಾ ಅನ್ವೇಷಕರು ಅಧ್ಯಯನದಿಂದ ಯಾವುದೇ ಸಮಯದಲ್ಲಿ ನನ್ನನ್ನು ನಿಲ್ಲಿಸಬಹುದು.

ಪ್ರಬಂಧ ಅಥವಾ ಸಂಶೋಧನೆಯ ಸ್ವಭಾವ, ಮಾಡಿದ ರೋಗನಿರ್ಧಾರ ಮತ್ತು ಚಿಕಿತ್ಸೆಯ ವಿಧಾನವನ್ನು ಅರ್ಥಮಾಡಿಕೊಂಡು, ನಾನು ಕೆಳಗಿನ ಶ್ರೀ / ಶ್ರೀಮತಿ_____ ನನ್ನ ಪೂರ್ಣವಾದ ಪ್ರಜ್ಞೆಯ ಸ್ಥಿತಿಯಲ್ಲಿ ಹೇಳಿದ ಸಂಶೋಧನೆ / ಪ್ರಬಂಧದಲ್ಲಿ ಪಾಲ್ಗೊಳ್ಳಲು ಒಪ್ಪುತ್ತೇನೆ.

ರೋಗಿಯ ಸಹಿ

ಡಾಕ್ಟರನ ಸಹಿ

ಸಾಕ್ಷಿಗಳು

1)

2)

ANNEXURE 4

PROFORMA

SCHEME OF CASE TAKING

1) NAME: CASE NO:

2) AGE: IP NO:

3) SEX: DOA:

4) RELIGION: DOS:

5)OCCUPATION: DOD:

6)RESIDENCE:

7)CHIEF COMPLAINTS:

8)HISTORY OF PRESENTING ILLNESS:

9)PAST HISTORY:

ALLERGY

- BRONCHIAL ASTHMA
- PREVIOUS THROAT SURGERY
- IRRADIATION
- HYPERTENSION

- PULMONARY TB
- DIABETES

10)PERSONAL HISTORY:

- SMOKING
- ALCOHOLISM
- DIET
- BOWEL AND BLADDER HABITS

11)FAMILY HISTORY: NIL RELEVANT

12)GENERAL PHYSICAL EXAMINATION

PALLOR:	PRESENT/ABSENT
ICTERUS:	PRESENT/ABSENT
CLUBBING:	PRESENT/ABSENT
GENERALIZED LYMPHADENOPATHY:	PRESENT/ABSENT
BUILD: NOURISHMENT	POOR/MEDIUM /WELL

13)VITALS

PR:

BP:

RR:

TEMP:

14)SYSTEMIC EXAMINATION

- CARDIOVASCULAR SYSTEM
- RESPIRATORY SYSTEM
- CENTRAL NERVOUS SYSTEM
- GASTROINTESTINAL SYSTEM

15)LOCAL EXAMINATION

- NOSE

EXTERNAL APPEARANCE

OSTEOCARTILAGENOUS FRAMEWORK

ROOT/TIP/DORSUM/ALA

ON TIP ELEVATION:

COLUMELLA/VESTIBULE

ANTERIOR RHINOSCOPY: RIGHT LEFT

NASAL CAVITY

NASAL SEPTUM

NASAL MUCOSA

TURBINATES

POSTERIOR RHINOSCOPY:

PARANASAL SINUSES:

- ORAL CAVITY:

MOUTH OPENING:

ORAL HYGIENE

LIPS/TEETH/TONGUE/GUM/GBS/BUCCAL MUCOSA/RMT/FLOOR OF MOUTH/PALATE

- OROPHARYNX

ANTERIOR PILLAR:

TONSILLAR FOSSA:

UVULA;

PPW:

POSTERIOR PILLAR:

- LOCAL EXAMINATION OF NECK: LYMPHADENOPATHY

JUGULODIGASTRIC LYMPH NODES

- EAR RIGHT LEFT PINNA

PRE AURICULAR AREA

POST AURICULAR AREA

EAC

TM

16)INVESTIGATION:

COMPUTED TOMOGRAPHY OF PARANASAL SINUSES

17)FINAL DIAGNOSIS:

18) Keros classification- Type1/Type 2/Type 3

19) Ethmoid Sinus Dimensions

- Height- Left-
  Right-
- Width- Left-
  Right-

ANNEXURE 5 (MASTERCHART)

Name	Age	Sex	UHID No.	Lund Mackay Score	Keros Classification	Right Ethmoid Sinus Height (mm)	Left Ethmoid Sinus Height (mm)	Right Ethmoid Sinus Width (mm)	Left Ethmoid Sinus Width (mm)	Roof symmetry	Height Difference	Width Difference
DEEPAK	19	Male	276670	0	Type 2 (4-7mm)	19.1	23.2	8.5	8.6	Left Side Taller	-4.1	-0.1
SHRINIVAS	29	Male	299546	0	Type 2 (4-7mm)	15	15	7.1	7.1	Symmetrical	0	0
MANJULA KHED	49	Female	296539	0	Type 3 (>7mm)	13	12.3	8	9.5	Right Side Taller	0.7	-1.5
SANDEEP	22	Male	291490	1-8 (Mild)	Type 3 (>7mm)	19.1	20.3	10.9	10.8	Left Side Taller	-1.2	0.1
HAFEEZA KASAB	50	Female	290086	0	Type 2 (4-7mm)	16.6	15	8.5	6.2	Right Side Taller	1.6	2.3
SURESH	52	Male	283632	17-24 (Severe)	Type 2 (4-7mm)	21.8	19.6	11.1	12.8	Right Side Taller	2.2	-1.7
SHRISHAIL	23	Male	263780	1-8 (Mild)	Type 2 (4-7mm)	22.5	22.7	1.06	1.05	Right Side Taller	-0.2	0.01
RUPA HANCHANAL	38	Female	260702	9-16 (Moderate)	Type 2 (4-7mm)	22.1	20.2	8.3	8.4	Symmetrical	1.9	-0.1
SUJATA BIRADAR	28	Female	193592	17-24 (Severe)	Type 2 (4-7mm)	21.8	16.1	12.6	9	Right Side Taller	5.7	3.6
PARASHURAM BHOC	30	Male	254456	0	Type 3 (>7mm)	20.2	20	13.7	13.3	Left Side Taller	0.2	0.4
SIDHANNA KABADAC	20	Male	154665	0	Type 1 (1-3mm)	18.1	18.1	12.6	12.5	Symmetrical	0	0.1
YASHWANT KARADE	52	Male	183066	1-8 (Mild)	Type 2 (4-7mm)	22.8	19.5	16.8	18	Right Side Taller	3.3	-1.2
AMIT LAMANMI	19	Male	144418	9-16 (Moderate)	Type 1 (1-3mm)	20	27.2	11.8	14.7	Left Side Taller	-7.2	-2.9
PRABHULING	35	Male	28015	0	Type 3 (>7mm)	25.5	25.8	10	10.2	Left Side Taller	-0.3	-0.2
RENUKA	28	Female	28017	17-24 (Severe)	Type 2 (4-7mm)	17.3	19.3	12.4	11.3	Right Side Taller	-2	1.1
YAMANURI	29	Male	28016	1-8 (Mild)	Type 3 (>7mm)	23.5	24	12.4	11.6	Left Side Taller	-0.5	0.8
GANESH JUMANAL	19	Male	168195	0	Type 2 (4-7mm)	18.1	18	10.2	10	Right Side Taller	0.1	0.2
SWAROOP BAMMAN	18	Male	212353	0	Type 2 (4-7mm)	14.5	14.5	10.7	11.5	Symmetrical	0	-0.8
MAHADEVI METAGAI	43	Female	185379	0	Type 2 (4-7mm)	18.6	18.6	8.8	8.8	Symmetrical	0	0
ADITYA PATIL	31	Male	156640	9-16 (Moderate)	Type 2 (4-7mm)	22.1	21.9	12.7	8.2	Left Side Taller	0.2	4.5
SANDEEP RATHOD	18	Male	149272	17-24 (Severe)	Type 2 (4-7mm)	20.6	22	11.1	12	Right Side Taller	-1.4	-0.9
SHASHANKH KANAP	18	Male	81381	0	Type 2 (4-7mm)	16	16	9.3	9.2	Symmetrical	0	0.1
RENUKA HALAGALI	33	Female	44417	9-16 (Moderate)	Type 2 (4-7mm)	25.8	22.4	10.2	10.2	Symmetrical	3.4	0
SURESH KOTTALAGI	45	Male	22556	1-8 (Mild)	Type 2 (4-7mm)	18.4	23.2	9.2	6.9	Left Side Taller	-4.8	2.3
SHAHEEN MAKANDA	27	Female	223318	17-24 (Severe)	Type 3 (>7mm)	19.6	21.3	9.2	9.8	Left Side Taller	-1.7	-0.6
SHINABAI RATHOD	42	Female	223544	0	Type 3 (>7mm)	16.2	16.2	10.2	8.7	Symmetrical	0	1.5
SIDDHARTH	20	Male	89652	9-16 (Moderate)	Type 2 (4-7mm)	20.7	19.6	6.5	9.2	Symmetrical	1.1	-2.7
LAXMIBAI MADDARAI	31	Female	227326	1-8 (Mild)	Type 2 (4-7mm)	17.9	16.9	10	10.6	Left Side Taller	1	-0.6
JAYASHREE KATNAL	47	Female	179340	0	Type 3 (>7mm)	27.1	27.1	11	9.1	Right Side Taller	0	1.9
SANDEEP MALI	14	Male	172686	0	Type 3 (>7mm)	19.1	18.8	1.72	1.69	Right Side Taller	0.3	0.03
GOURAMMA	29	Female	309869	9-16 (Moderate)	Type 2 (4-7mm)	20.6	21.1	10.4	10.9	Right Side Taller	-0.5	-0.5
SUMANGALA KHARA	27	Female	18786	0	Type 2 (4-7mm)	19.7	19.5	11.4	11.1	Left Side Taller	0.2	0.3
MALASHREE TALAW	30	Female	44280	9-16 (Moderate)	Type 3 (>7mm)	20.6	22.5	8	8.3	Symmetrical	-1.9	-0.3
MAHADEVI SIDDARE	65	Female	135882	0	Type 2 (4-7mm)	17	17	10.5	9.2	Symmetrical	0	1.3
SHRISHAIL KADAGOI	25	Male	57703	0	Type 2 (4-7mm)	21.1	21.1	10.4	12.1	Symmetrical	0	-1.7
REKHA HADALASAN	44	Female	91233	1-8 (Mild)	Type 3 (>7mm)	19.1	19.7	10.6	10.3	Left Side Taller	-0.6	0.3
SHIVANGOUDA	47	Male	71858	0	Type 2 (4-7mm)	18.1	17.2	10.8	10.4	Right Side Taller	0.9	0.4
SAVITHA UKKI	43	Female	59266	9-16 (Moderate)	Type 3 (>7mm)	19.8	18.4	9.7	9.1	Symmetrical	1.4	0.6
PREMA DEVI	49	Female	82341	0	Type 2 (4-7mm)	17.6	17.2	9.8	9.6	Left Side Taller	0.4	0.2
SAROJINI	46	Female	583	0	Type 2 (4-7mm)	22	22	8	8.1	Symmetrical	0	-0.1
BHAVANA	30	Female	27745	0	Type 1 (1-3mm)	17.5	17.5	8.6	8.9	Symmetrical	0	-0.3
ASIM	42	Male	54471	0	Type 2 (4-7mm)	18.2	19	11.1	10.4	Left Side Taller	-0.8	0.7
KIRAN	30	Male	14452	0	Type 3 (>7mm)	16.5	17	10.3	10.3	Left Side Taller	-0.5	0
MAHADEVI PATIL	35	Female	29220	0	Type 2 (4-7mm)	15.2	15.2	9.4	9.6	Symmetrical	0	-0.2
ANJALI	28	Female	94221	0	Type 2 (4-7mm)	17.5	17.5	8.5	7.9	Symmetrical	0	0.6
AKASH	32	Male	25541	0	Type 2 (4-7mm)	19.2	19.6	11	11.5	Left Side Taller	-0.4	-0.5
MANJUNATH	44	Male	149982	0	Type 3 (>7mm)	16.2	16	10.2	10.6	Right Side Taller	0.2	-0.4
DAYARAM	50	Male	26587	0	Type 2 (4-7mm)	17.5	17.5	11.3	12.9	Symmetrical	0	-1.6
KASHINATH	36	Male	14478	0	Type 2 (4-7mm)	19.1	19.1	11.5	11.9	Symmetrical	0	-0.4
SARVESH MITTAL	25	Male	19821	0	Type 2 (4-7mm)	22.9	22.5	9.8	9.5	Right Side Taller	0.4	0.3
DANAMMA	38	Female	75442	0	Type 2 (4-7mm)	14.5	14.9	8.5	8.1	Left Side Taller	-0.4	0.4
CHETAN	22	Male	17365	0	Type 2 (4-7mm)	21.1	21.1	9.6	9.4	Symmetrical	0	0.2
DANAMMA BADIGAR	40	Female	34784	0	Type 1 (1-3mm)	14.6	14.1	8.8	9	Right Side Taller	0.5	-0.2
HANAMANTH	34	Male	12879	0	Type 2 (4-7mm)	18.9	18	10.3	9.9	Right Side Taller	0.9	0.4
RAMCHANDRA	50	Male	98112	0	Type 2 (4-7mm)	16.7	17.4	11	10.5	Left Side Taller	-0.7	0.5
AKSHAY	29	Male	15574	0	Type 2 (4-7mm)	20.1	20.1	9.5	9.9	Symmetrical	0	-0.4
ANUSHKA	22	Female	3887	0	Type 1 (1-3mm)	14.6	14.9	8.1	8.3	Left Side Taller	-0.3	-0.2
KIRANKUMAR	40	Male	18644	0	Type 2 (4-7mm)	17.2	16.5	9.1	9.6	Right Side Taller	0.7	-0.5
ABDUL	35	Male	74261	0	Type 2 (4-7mm)	18.8	18.2	10.7	10.5	Right Side Taller	0.6	0.2
VIREN	30	Male	18889	0	Type 2 (4-7mm)	16.6	16.6	9.7	9.6	Symmetrical	0	0.1
SHREYA	24	Female	20774	0	Type 2 (4-7mm)	14.7	14.7	8.5	8.6	Symmetrical	0	-0.1
RAMANGOUDA	46	Male	70558	0	Type 3 (>7mm)	19	19	9.4	9.5	Symmetrical	0	-0.1
BOURAMMA	30	Female	14996	0	Type 2 (4-7mm)	16.7	16.3	7.3	7.9	Right Side Taller	0.4	-0.6
UMESH	41	Male	32811	0	Type 2 (4-7mm)	17.7	17.7	9	8.7	Symmetrical	0	0.3
MANJULA PATIL	44	Female	96110	0	Type 2 (4-7mm)	13.7	14	8.6	8	Left Side Taller	-0.3	0.6
RISHIKESH	24	Male	188742	0	Type 3 (>7mm)	15.5	15.5	8.8	8.1	Symmetrical	0	0.7
KAVITA	46	Female	17440	0	Type 2 (4-7mm)	16.6	16.4	9	9.1	Right Side Taller	0.2	-0.1
MADHUKAR	33	Male	23045	0	Type 2 (4-7mm)	17.7	17.5	7.8	8	Right Side Taller	0.2	-0.2
KRISHNA LOHITH	33	Male	71664	9-16 (Moderate)	Type 2 (4-7mm)	19.2	18.8	9.1	8.8	Right Side Taller	0.4	0.3
SATISH BHAT	29	Male	184330	1-8 (Mild)	Type 2 (4-7mm)	17	17.6	8.6	8	Left Side Taller	-0.6	0.6
SUNILKUMAR	37	Male	270081	9-16 (Moderate)	Type 2 (4-7mm)	18.8	18.3	10	10.3	Right Side Taller	0.5	-0.3
ARJUN NAIK	24	Male	13745	17-24 (Severe)	Type 2 (4-7mm)	15	15.8	9.7	9.2	Left Side Taller	-0.8	0.5
SUNIL HUDDAR	30	Male	14570	9-16 (Moderate)	Type 2 (4-7mm)	16.9	16.9	8.5	8.8	Symmetrical	0	-0.3
NAVEEN	29	Male	23770	1-8 (Mild)	Type 1 (1-3mm)	15.5	15.6	9	9.4	Left Side Taller	-0.1	-0.4
RUKMINI	40	Female	24816	9-16 (Moderate)	Type 2 (4-7mm)	19	18.8	7	7.5	Right Side Taller	0.2	-0.5
BASAMMA GODKHIN	37	Female	157933	9-16 (Moderate)	Type 2 (4-7mm)	16.7	16.1	8.4	8	Right Side Taller	0.6	0.4
SACHIV T	28	Male	6227	1-8 (Mild)	Type 3 (>7mm)	14.2	14.8	7.9	8.3	Left Side Taller	-0.6	-0.4
GOVIND	19	Male	3744	1-8 (Mild)	Type 2 (4-7mm)	17	17.6	8	8.1	Left Side Taller	-0.6	-0.1
ARAVIND HOSAMANI	39	Male	23370	9-16 (Moderate)	Type 2 (4-7mm)	19	19.2	9	9.3	Left Side Taller	-0.2	-0.3
SUDHEER BELGAVI	20	Male	27714	1-8 (Mild)	Type 2 (4-7mm)	17.5	17.5	8.7	8.9	Symmetrical	0	-0.2
PALLAVI	24	Female	36442	9-16 (Moderate)	Type 2 (4-7mm)	15.4	16	8.2	8.3	Left Side Taller	-0.6	-0.1
BORAVVA	35	Female	17743	9-16 (Moderate)	Type 2 (4-7mm)	14.7	15	9	8.4	Left Side Taller	-0.3	0.6
CHANDAVVA	44	Female	9070	9-16 (Moderate)	Type 3 (>7mm)	16.6	16.5	10	10.6	Right Side Taller	0.1	-0.6
SHILPA AMBIGAR	31	Female	16637	1-8 (Mild)	Type 2 (4-7mm)	17.5	17.3	9.4	9.2	Right Side Taller	0.2	0.2
SURYAKUMAR	22	Male	32441	9-16 (Moderate)	Type 2 (4-7mm)	18.8	19.4	11.2	11	Left Side Taller	0.5	0.2
NIKHIL	21	Male	15504	9-16 (Moderate)	Type 2 (4-7mm)	17.7	17.6	7.3	7.6	Right Side Taller	0.1	-0.3
PRAMOD PATIL	30	Male	29071	9-16 (Moderate)	Type 2 (4-7mm)	19	19.5	8.3	8.8	Left Side Taller	-0.5	-0.5
VIJAYANTI	22	Female	40552	1-8 (Mild)	Type 2 (4-7mm)	16.9	17	10	10.5	Left Side Taller	-0.1	-0.5
HARISH	38	Male	31107	1-8 (Mild)	Type 3 (>7mm)	16	15.3	11.1	11.6	Right Side Taller	0.7	-0.5
SANDEEP	30	Male	18873	9-16 (Moderate)	Type 2 (4-7mm)	19	19.7	7.6	7.9	Left Side Taller	-0.7	-0.3
PRAVIN	20	Male	23330	9-16 (Moderate)	Type 1 (1-3mm)	20.3	20	9	8.6	Right Side Taller	0.3	0.4
SUDARSHAN	45	Male	43997	1-8 (Mild)	Type 2 (4-7mm)	21	20.7	8.1	7.7	Right Side Taller	0.3	0.4
RAVI BAJANTRI	37	Male	63771	9-16 (Moderate)	Type 2 (4-7mm)	17.4	17.4	8.8	8.7	Symmetrical	0	0.1
DHANYA BAJANTRI	41	Female	24410	9-16 (Moderate)	Type 2 (4-7mm)	17	17.3	9	9.3	Left Side Taller	-0.3	-0.3
NIRANJANA	33	Female	16433	1-8 (Mild)	Type 1 (1-3mm)	18	18.6	7.9	8.3	Left Side Taller	-0.6	-0.4
POORNIMA SAVANT	25	Female	4990	9-16 (Moderate)	Type 2 (4-7mm)	17.7	17.3	9	8.7	Right Side Taller	0.4	0.3