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Paranasal Sinuses in the Evaluation of Sinusitis using Computed Tomography: Cross Sectional Study

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Abstract **Original Research Article**

Background: Recent advances in the understanding the pathophysiology paranasal sinuses have revolutionized the surgical management of chronic and recurrent sinusitis. Paranasal sinus is air-filled spaces in the interior skull and facial bones. Symptoms of a common cold include nasal discharge, nasal obstruction, headache, and nasal allergy in the majority of patients. CT is a superlative modality to describe the sinus anatomy along with soft tissue structure. As compared to sinus radiographs, computed tomography scanning has improved the imaging of paranasal sinus anatomy. ***Objective*:** To determine paranasal sinuses in evaluation of sinusitis using computed tomography. ***Material Methods*:** From October 2020 to March 2021, a cross-sectional analysis was performed at Aziz Bhatti Shaheed (DHQ) Teaching Hospital Gujrat and Azeem ultrasound and diagnostic center Gujrat. Data of 100 patients was collected through convenient sampling technique adults and children with sinusitis were included in the study data of patients with recent cold associated with irritated nasal discharge and headache along with congestion was collected from the patients. For data processing, the Statistical Kit for the Social Sciences (spss) is used. ***Results*:** Out of 100 patients 50 were male & 50 were female majority of the patients were in 25-40 age group. 12 out of 100 had nasal obstructions, 27 patients were presented with headache, 27 patients had the history of facial pain. Maxillary sinuses are mostly involved in study 13 had bilateral maxillary sinusitis 13% left maxillary right sphenoidal and ethmoidal sinusitis followed by ethmoid sinus and frontal sinus. Mucosal thickening (mild 76 percent, moderate 20 percent) is the most often observed mass and symptom of sinusitis. The final result came out 5 % PAN sinusitis. ***Conclusion:*** Pathologies in paranasal sinuses is frequently found on computed tomography imaging and has to be cured or monitored consequently. The best modality for diagnosing and preparing therapy for clinically current sinusitis is computed tomography.

Keywords: Para nasal sinuses, sinusitis, computed tomography.

INTRODUCTION

Para nasal sinuses are hollow air-filled cavities in human facial bones, which acts an essential role which includes reducing skull weight, humidifying and warming of inhaled air, pressure control within the nasal cavity, also trapping dust particles [1]. There are four combined Para nasal sinuses; are maxillary, frontal, and sphenoid sinuses as well as ethmoid cells by abundant inter and intra-individual similarities [2]. Three essential components make up the para nasal sinus: thin natural mucus secretions, normally working hair-like cilia that exchange mucus out of sinuses, and an open sinus drainage opening known as the sinus ostium [3]. The word sinusitis mentions a collection of conditions described by swelling of the mucosa of Para nasal sinuses. The pathological lesions of the para nasal sinuses vary from inflammation to cancerous types, which may be benign or malignant however; sinusitis is usually described as nasal and Para nasal sinus mucosal inflammation of the mucous membrane that lines the sinuses which resulting in symptoms like nasal discharge, sore throat, nasal obstruction, cough, headache, nasal allergy [4]. Earlier studies have revealed that people are prone to several diseases of Para nasal sinuses due to different causes such as allergy, extreme exposure to cold, tobacco smoking, alcohol intake, trauma, and infections by a pathogen such as a virus, bacteria, and fungi [1]. Sinusitis is a swelling of the nasal sinus, it is also well-known as rhino sinusitis, and is a common medical problem in the

ear, nose, and throat ENT department. The maxillary sinus is one of four nasal sinuses held in cheekbones. Its shapes similar to the pyramid and each hold three cavities [5]. The analysis of acute sinusitis is made through medical conditions also depend on the occurrence and array of indications that can distinguish between acute sinusitis and a simple virus-related URI [6]. Acute sinusitis is a small period of inflammation of the membrane of the nose and surrounding sinus is mostly due to cold-causing infection or it may be non-infection [5]. Rhino sinusitis is a unique disease affecting people worldwide with a significantly bad effect on the quality of life [7]. The presence of at least 2 out of four cardinal symptoms (facial pain, compression, drainage, nasal obstacle) for at least 12 repeated weeks is well established in maximum guidelines [8]. Sinusitis is now well recognized as primarily a psychiatric diagnosis. A physical examination may help differentiate sinusitis from a minor upper respiratory tract infection as patient records suggest sinusitis [3].

Imaging technologies used in nose study and Para nasal sinuses (PNS) play a significant role in the treatment of multiple pathologies. Recent or innovative imaging technology such as computed tomography and MRI plays a vital role to analyze Para nasal sinuses more accurately than conventional X-rays [9]. Computed tomography has shown huge progress since the initial house field CT images obtained at the end of 1970 [4]. On a point that preoperative worksheet in the estimation of Sino nasal CT scan boosts the protection also the ability of nose as well as Para nasal sinus surgical treatment [10]. Additionally in the physical sets, the multislice CT scans are organized that reduced patient distress due to smaller as well as less breath holds also reducing the requirement of lethargy for agitated patients [11, 14]. This study meant to estimate also concludes the incidence of the structural differences must be measured to escape the difficulties that might take place during the invasive process [12]. Conventional x-rays of Para nasal sinuses PNS is still the simplest and cheapest method of diagnosing the PNS pathologies but because of the superimposition of structure in x-rays and inadequate diagnostic information, it cannot be used as a guide for endoscopic sinus surgery [1]. The high prevalence of Para nasal sinus abnormalities is linked with environmental pollution, which is common due to numerous oil and gas industrial activities in the area [1]. The goal of the current study was to estimate the CT findings in three different areas i.e. nasal septum, nasal turbinate's, and Para nasal sinuses, in patients booked for rhinoplasty [13]. Computed tomography executes a very important role to value pathologies in strenuous especially in ethmoid in sphenoid sinuses [9]. Essentially, CT scan proved to be an excellent imaging modality because it accurately diagnosed and differentiated benign and malignant lesions, as well as delineated their genesis, appearance, expansion, and presence. With the unique ability of CT to image soft bone tissue, direct coronal scans and sagittal reconstruction, the lesions occupying the space [5]. The management and results of smell complaint of conductive damage are dissimilar to sensorineural damage [14]. The prevalence of these findings is needed to determine their clinical relevance and to guide its management [15].

MATERIAL AND METHOD

From October 2020 to March 2021, a cross-sectional analysis was performed at Aziz Bhatti Shaheed (DHQ) Teaching Hospital Gujrat and Azeem ultrasound and diagnostic center Gujrat. Data of 100 patients was collected through convenient sampling technique adults and children with sinusitis were included in the study data of patients with recent cold associated with irritated nasal discharge and headache along with congestion was collected from the patients. For data processing, the Statistical Kit for the Social Sciences (SPSS) is used.

RESULTS

Out of 100 patients 50 were male & 50 were female majority of the patients were of 25 to 40 age group.12 out of 100 had nasal obstructions, 27 patients were presented with headache, 27 patients had the history of facial pain. Maxillary sinuses are mostly involved in study 13 had bilateral maxillary sinusitis 13% left maxillary right sphenoidal and ethmoidal sinusitis followed by ethmoid sinus and frontal sinus. Mucosal thickening (mild 76 percent, moderate 20 percent) is the most often observed mass and symptom of sinusitis. Final result came out 5 % PAN sinusitis**.**

Table-1: Clinical findings

Symptoms	Frequency	Percent	Valid Percent	Cumulative Percent
Fever , headache	1	1.0	1.0	51.0
Fever , nasal obstruction	1	1.0	1.0	52.0
Fever , nasal stiffness	1	1.0	1.0	53.0
Fever ,pressure or pain in sinus	2	2.0	2.0	55.0
Fever facial tenderness	1	1.0	1.0	56.0
Fever, facial tenderness	1	1.0	1.0	57.0
Headache , facial pain	27	27.0	27.0	84.0
Nasal discharge , fever	12	12.0	12.0	96.0
Nasal discharge, fever, facial swallowing	2	2.0	2.0	98.0
Nasal obstruction	2	2.0	2.0	100.0
Total	100	100.0	100.0	

Results indicate that headache and facial pain are 27% nasal discharge and fever are 12%, pressure and pain are 2%.

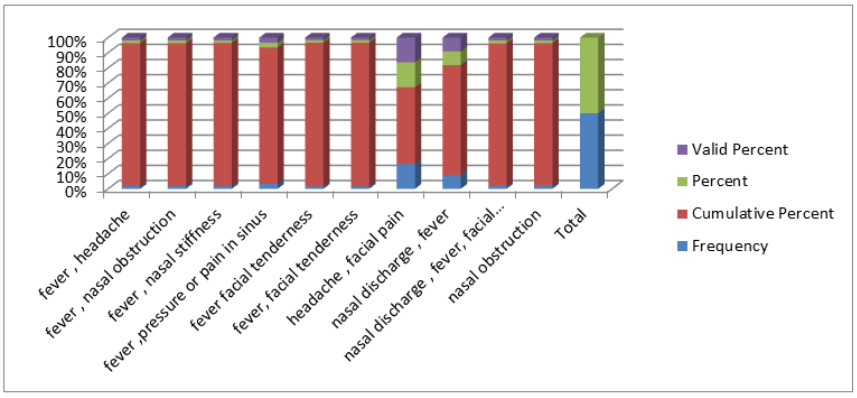

Fig-1

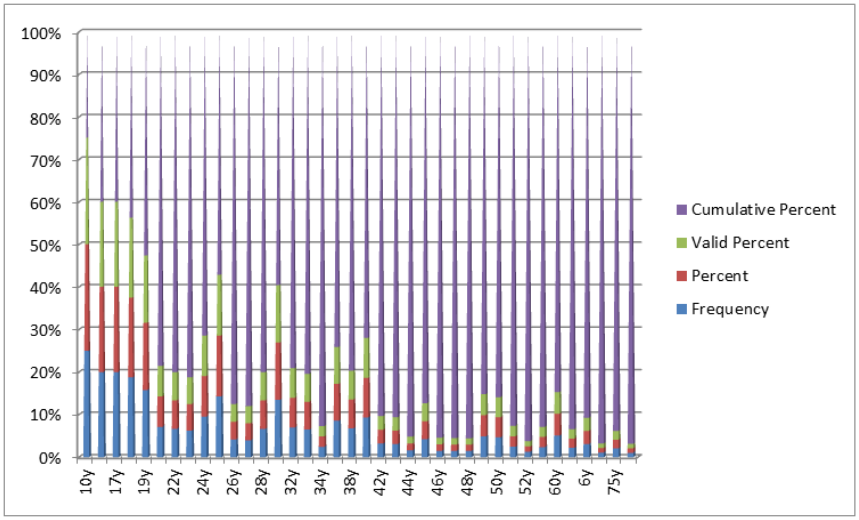

Fig-2: Age Distribution

Results indicate that majority of cases are between 25 to 40 years and most of them are 30year old (7%), 40 year old (7%) and 25 year old (5%).

Table-3: CT PNS Findings Mucosal Thickening

Severity	Frequency	Percent	Valid Percent	Cumulative Percent
mild	76	76.0	76.0	76.0
mild	3	3.0	3.0	79.0
moderate	20	20.0	20.0	99.0
normal	1	1.0	1.0	100.0
Total	100	100.0	100.0	

This result indicate that mild mucosal thickening is 76% and moderate mucosal thickening is 20%

Table-4: Impression

	Frequency	Percent
Valid LT mastioditis , LTsphenoid sinusitis	1	1.0%
bilateral ethmoidal and left sphenoidal sinusitis	1	1.0%
bilateral ethmoid sinusitis	**1**	1.0%
bilateral ethmoid sinusitis and LF sphenoidal sinusitis	1	1.0%
bilateral ethmoidal sinusitis	**1**	1.0%
bilateral inferior turbinate thickening	1	1.0%
bilateral maxillary and ethmoidal sinusitis	**1**	1.0%
bilateral maxillary sinusitis	**13**	13.0%
bilateral maxillary sinusitis ,LT ethmoidal sinusitus	1	1.0%
bilateral maxillary sinusitis ,LT sphenoidal and ethmoidal sinusitis	1	1.0%
bilateral maxillary sinusitis and left ethmoidal sinusitis	**1**	1.0%
ethmoidal sinusitis	**1**	1.0%
ethmoidal sinusitis and maxillary sinusitis	**1**	1.0%
extensive fungal sinusitis	**4**	4.0%
extensive pan sinusitis	**1**	1.0%
extensive sinusitis involving left side sinuses	1	1.0%
extensive sinusitis involving left side sinuses with polypolidial	1	1.0%
Fungal sinusitis	**2**	2.0%
LT ethmoidal and LT sphenoidal sinusitis	1	1.0%
LT ethmoidal sinusitis	**1**	1.0%
LT frontal and bilateral sinusitis	2	2.0%
LT maxillary , RT sphenoidal and ethmoidal sinusitis	1	1.0%
LT maxillary sinusitis	13	13.0%
LT maxillary sinusitis ,polyp sinus	1	1.0%
LT maxillary sinusitis, acute sinusitis	1	1.0%
LT nasal polyps	1	1.0%
LT spheniodal sinusitis	5	5.0%
maxillary sinusitis	1	1.0%
nasal polyposis	1	1.0%
nasal polyposis and sinusitis	1	1.0%
pan sinusitis	5	5.0%
RT acute sphenoidal sinusitis	1	1.0%
RT ethmoidal fungal sinusitis, RT sphenoid chronic sinusitis	1	1.0%
RT ethmoidal sinusitis	1	1.0%
RT frontal sinusitis	1	1.0%
RT frontal , ethmoidal, bilateral maxillary, RT sphenoidal sinusitis	1	1.0%
RT inferior turbinate thickening	1	1.0%
RT mastiodititis	1	1.0%
RT maxillary ,frontal ,ethmoidal sinusitis	1	1.0%
RT maxillary and ethmoidal sinusitis	1	1.0%
RT maxillary sinusitis	5	5.0%
RT maxillary sinusitis, LT sinunasal polyp	1	1.0%
RT maxillary sinusitis	3	3.0%

RT maxillary acute sinusitis	1	1.0%
RT nasal polyp and sinusitis	2	2.0%
RT sphenoid sinusitis	5	5.0%
Sinusitis	5	5.0%
sphenoidal sinusitis	1	1.0%
Total	100	100.0%

	Frequency	Percent	Valid Percent	Cumulative Percent
sphenoidal sinusitis	1	1.0	1.0	100.0
Total	100	100.0	100.0	

Result indicate that mostly seen patients with bilateral maxillary sinusitis 13% left maxillary sinusitis 13%

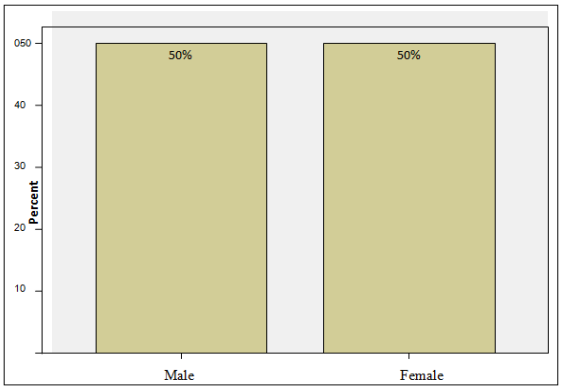

Fig-3: Gender

Graphical representation shows those patients of sinusitis on CT scan finding present 50% male and 50% female patients.

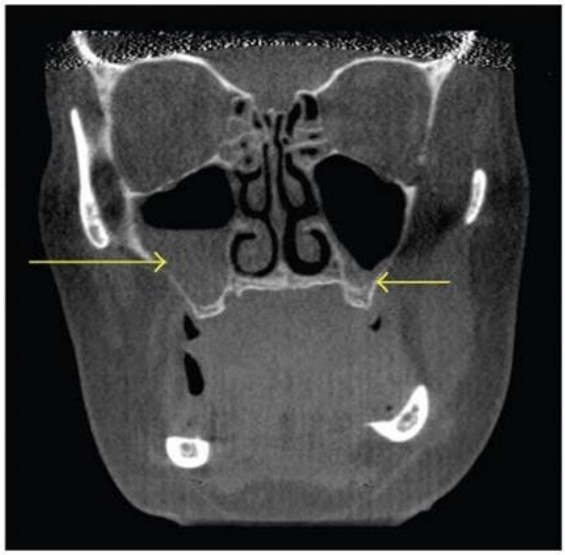

Fig-4: Showing CT scan image arrows indicating Bilateral maxillary sinusitis (coronal view)

DISCUSSION

The aim of the research was to use CT to confirm the diagnosis of paranasal sinusitis. A history of 100 patients was collected and compared among these patients who had sinusitis. These patients were presented with a history of cough, headache, and facial pain it is critical to confirm that if chronic rhino sinusitis is described based on subjective knowledge; an empirical result may be obtained with CT. The evaluation of sinusitis between male and female ratio is 50%. According to the study conducted by author Michael promise Ogolodom *et al*., sinusitis was the most common paranasal sinuses disease in this study, while osteoma was the least common.

The most often affected sinuses were the maxil lary sinuses [1]. This study conducted by author ohood A. Mohammed *et al*., 2019. Preoperative identification of the anatomical difference of the paranasal sinuses is crucial. These differences were discovered to differ by area and nation. In our research, we discovered that all patients with rhinosinusitis have one or more of the anatomical variations listed.

The most common anatomical variation is a de viated nasal septum (93.11 percent), followed by aggern asi cell d(93.11 percent) (51.02 percent) Junaid Iqbal *et al*., 2017 [2]. Computed Tomography Evaluation of Anatomical Variations of the Paranasal Sinuses Region of Rhinosinusitis was the subject of a research project. Of the 120 patients, 49 (41%) were female and 71 (59%) were male. The patients were 35.211.61 years old on a verage. 33percent (27.5%) were between the ages of 20 and 30, 35 percent (29%) were between the ages of 30 a nd 40, 29 percent (24%) were between the ages of 40 an d 50, and the remaining 23 percent (19%) were over 40. Sinusitis caused by fungus on both sides was marginall y more common [2]. According to this study conducted by author Alia Ahmad *et al*., 2016 In this study, 55 patients ranging in age from 20 to 55 years old were included. 33 (60%) of the patients were male, while the remaining 22 (40%) were female. 12 (21.82%) patients were between the ages of 20 and 29, 13 (23.64%) patients were between the ages of 30 and 39, 18 (32.72%) patients were between the ages of 40 and 49, and 12 (21.82%) patients were over the age of 49. By clinically standard x-ray observation, 26 (47.27 percent) of the 55 patients had acute sinusitis, while 29 (52.73 percent) had chronic sinusitis [3].

The pathologies in this study were seen in peo ple aged 16 to 30.The oldest were between the ages of 0 and 15, while the youngest were between the ages of 0 and 15.Sinusitis has been the most common PNS. For several years, I worked in pathology. The diagnosis of chronic rhino sinusitis is focused mostly on major and minor symptoms in these age ranges, with care administered based on the diagnosis. Patients who follow the symptoms-based definitions of chronic rhino sinusitis are advised to administer antibodies for several weeks. This project was undertaken to provide a slandered description of chronic rhino sinusitis, as well as to make a diagnosis based on endoscopy or CT scans. Endoscopy was used to assess the function of endoscopy in the diagnosis of chronic, non-polyp, unoperated rhino sinusitis. My research showed that pathologies such as maxillary sinusitis are commonly detected on Computed tomography imaging and must be treated or monitored appropriately. Computed tomography should be used to diagnose and schedule therapy for sinusitis that is clinically present. The commonest Para nasal sinuses frequency in this study was sinusitis these findings are keeping with the study done.

CONCLUSION

Pathologies in paranasal sinuses is frequently found on computed tomography imaging and has to be cured or monitored consequently. The best modality for diagnosing and preparing therapy for clinically current sinusitis is computed tomography. For diagnosing paranasal sinus pathologies CT imaging shows an accurate use in diagnosis of acute sinusitis and a sufficient limit in the diagnosis of chronic sinusitis. Without waiting for culture results, the imaging modality can be used to diagnose certain infections quickly.

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