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A Comparative Anatomical Study Of Phana Marma In Ayurveda And Modern Sinus Anatomy With Special Reference To Dushta Pratishyaya (CHRONIC RHINOSINUSITIS)

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ABSTRACT

Background: The disease *Dushta Pratishyaya* is a chronic nasal condition affecting the nasal cavity and paranasal sinuses. In contemporary medicine, it correlates with chronic rhinosinusitis. According to Ayurvedic texts, *Phana Marma*, classified under *Vaikalyakara Marma*, is situated on either side of the nostrils and is associated with the *Ghrana Sangyavaha Srotas*. It plays a vital role in olfactory function. Olfactory loss may be partial (*hyposmia*) or complete (*anosmia*), & its duration depends on the underlying pathology.

Materials and Methods: This anatomical study of *Phana Marma* draws references from the *Brihattrayi*, *Laghutrayi*, and other classical Ayurvedic sources, supported by modern anatomical and clinical literature including journals, dissertations, and conference papers. The study included 31 patients who presented with symptoms such as rhinorrhea, nasal blockage, headache, and facial pain, unresponsive to medical treatment, with radiological findings of haziness, opacification, or air-fluid levels on 45° Water's view X-ray of the paranasal sinuses. Patients with nasal tumors, polyps, allergic mucosal thickening, previous nasal surgeries, age below 18 or above 60.

Results: Out of 31 enrolled patients, 30 completed the study and were analyzed. A significant association was observed between the number of symptoms of *Dushta Pratishyaya* involving *Phana Marma* and the severity of mucosal thickening. As the number of symptoms increased, mucosal thickening progressed from mild to severe, with a statistically significant p-value (<0.05).

Conclusion: This study highlights the anatomical importance of Phana Marma by establishing its correlation with the olfactory epithelium, which is located in the upper third of the nasal cavity. The olfactory axons pass through the cribriform plate and connect receptors to the olfactory bulb. Any trauma or pathology affecting these structures can result in olfactory dysfunction. The findings affirm the Ayurvedic concept of *Phana Marma* and its practical correlation with modern sinus anatomy and clinical manifestations of *Dushta Pratishyaya*.

Keywords: *Ayurveda, Phana Marma, Dushta Pratishyaya, Chronic Rhinosinusitis.*

1. INTRODUCTION

The concept of Marma holds a pivotal place in Ayurveda, representing a vital intersection of anatomical, physiological, and prognostic principles. These Marma points are considered crucial sites within the human body, where trauma can lead to severe consequences, including deformity or death, depending on the nature and intensity of the injury [1]. The early practice of surgery in ancient India was significantly shaped by wartime injuries, which served as both a stimulus and a foundation for the development of surgical knowledge and traumatology. Such evolution underscores the necessity of a profound understanding of human structural anatomy in the effective practice of surgery [2].

In classical Ayurvedic literature, anatomical comprehension was deeply rooted in the understanding of Marma. A total of 107 principal Marma points are described, each serving as a vital anatomical locus where multiple structures converge. These are identified as seats of life (*Jeevasthana*) and sites of union (*Sandhisthana*) [3,4]. As detailed by Acharyas, each Marma represents a confluence of Mamsa (muscle), Sira (vessels), Snayu (ligaments), Asthi (bones), and Sandhi (joints), within which resides *Prana*, the life force. Additionally, *Ashtanga Hridaya* includes Dhamani (arteries) as an essential component in this structural assembly [5].

Among various Marma points, Phana Marma, located adjacent to the nostrils, holds particular relevance in the context of nasal disorders. Its association with the sense of smell (*Ghrana Indriya*) and its classification as a *Vaikalyakara Marma* (causing deformity if injured) suggests a probable role in olfactory dysfunction and nasal pathologies.

The classical disease entity Dushta Pratishyaya—a chronic condition characterized by nasal inflammation—bears a strong resemblance to the modern medical diagnosis of Chronic Rhinosinusitis (CRS). Ayurvedic texts describe symptoms such as Puyopamasrava (purulent nasal discharge), Punascha Praklinna Nasa and Punascha Parisushyati (alternating moist and dry nasal mucosa), and Gandhannaveti (loss or distortion of smell), which align closely with modern CRS symptomatology [6].

In contemporary medicine, rhinitis and sinusitis often co-exist, leading to the combined term *rhinosinusitis*. CRS is defined as inflammation of paranasal sinuses persisting for over 12 weeks, typically presenting with nasal obstruction, facial pain or pressure, mucopurulent discharge, and anosmia, corroborated by endoscopic or radiologic evidence [7].

CRS is known to substantially impact the quality of life of affected individuals—sometimes more so than other chronic illnesses—by causing persistent physical discomfort and impairing social interaction. Globally, it is estimated to affect around 2% of the population [8], and its socio-economic burden is significant due to healthcare costs and productivity loss. The underlying pathophysiology often involves obstruction of the ostiomeatal complex, a crucial region for sinus drainage, commonly impaired by structural anomalies, infections, or allergic reactions [9–11].

While the standard diagnosis of CRS involves nasal endoscopy or CT imaging, such modalities are often inaccessible in rural and resource-constrained settings due to high costs and limited availability of specialized equipment [12]. In these contexts, the X-ray PNS 45° Water's View emerges as a practical, cost-effective alternative for evaluating sinus pathology [13].

This imaging technique is especially useful in primary care and rural setups, where diagnostic services are limited. It can even be employed in off-grid locations using portable, battery-operated radiography units [14]. Radiographic features suggestive of sinusitis include mucosal thickening (seen in ~90% of cases), air-fluid levels, and complete opacification—with the latter two offering greater diagnostic specificity (~60%) [15]. However, the effectiveness of this modality largely depends on the clinical interpretation skills of the healthcare provider [16].

In the Indian healthcare landscape, particularly within rural populations, where access to advanced diagnostics is minimal, PNS 45° radiography remains the most accessible and economically viable method for detecting sinus pathology. Therefore, there is a compelling need to evaluate its predictive utility and diagnostic accuracy, to reinforce its continued use in standard clinical practice [17].

In Ayurveda, the concept of Phana Marma holds an important place in the understanding of anatomical and physiological functions. It is classified as a Vaikalyakara Marma (vital point causing deformity upon injury) and predominantly a Sira Marma (vascular structure-related Marma). Descriptions of Phana Marma across classical Ayurvedic texts consistently emphasize its anatomical relevance to the olfactory system.

- **Sushruta Samhita:** Acharya Sushruta describes Phana Marma as located within the Srotomarga (nasal passage), specifically on both sides of the nasal pathway. Injury to this Marma results in Gandha Agyana (loss of the sense of smell), directly correlating it with the function of the olfactory system. Sushruta classifies Phana Marma as a Vaikalyakara and Sira Marma [18].
- **Ashtanga Sangraha:** Phana Marma is located on either side of nostrils, near the openings of the ears and extending to the inside of the throat. This text also categorizes it as a Vaikalyakara and Sira Marma [19].
- **Ashtanga Hridayam:** Similarly, Acharya Vagbhata describes Phana Marma as lying on either side of the nostrils, reinforcing its classification as a Sira Marma, responsible for olfactory disturbances upon injury [20].
- **Bhavaprakasha:** Acharya Bhavamishra specifies that Phana Marma measures half an Angula in size. The text also highlights Gandha Agyana (loss of smell) as a significant consequence of injury to this Marma [21].

Modern Anatomical Correlation

From a contemporary anatomical standpoint, the region corresponding to Phana Marma is the olfactory apparatus:

Olfactory Receptors

The olfactory receptors are specialized bipolar neurons located within a yellowish patch of mucous membrane in the roof of nasal cavity. These neurons possess non-motile cilia that are sensitive to odorant molecules. Their axons collectively form the olfactory nerve (Cranial Nerve I), which traverses the perforations of cribriform plate in the ethmoid bone to reach the olfactory bulb, where they form synapses [22].

Olfactory Bulb

Located on the underside of the frontal lobes, the olfactory bulb functions as the primary site for processing smell-related signals. Within this structure, olfactory nerve fibers form synapses with mitral cells, which in turn transmit the sensory

information along the olfactory pathway.

Olfactory Tract

The olfactory tract is a neural pathway extending from the olfactory bulb to the olfactory cortex of the cerebral hemispheres. These tracts predominantly transmit olfactory signals to the ipsilateral side of the brain, allowing the perception of smell.

Injuries to the Phana Marma, which correspond to this region, can cause hyposmia (partial loss of smell) or anosmia (complete loss of smell). These conditions align closely with the symptoms of Gandha Agyana described in Ayurvedic texts, which occur due to trauma to the olfactory system.

2. AIMS AND OBJECTIVES

1. To explore the anatomical description of Phana Marma as per classical Ayurvedic texts, including Brihattrayi and Laghutrayi.
2. To interpret and correlate the anatomical structures of Phana Marma with reference to its involvement in Dushta Pratishyaya (Chronic Rhinosinusitis), utilizing modern anatomical and clinical understanding.

3. MATERIALS AND METHODS

his study on Phana Marma is grounded in classical Ayurvedic literature, including the Brihattrayi and Laghutrayi, supplemented by additional sources such as Ayurvedic dictionaries, research journals, conference presentations, and previous dissertations. The anatomical and clinical relevance of Phana Marma will be critically correlated with modern scientific insights, particularly in the context of Dushta Pratishyaya (Chronic Rhinosinusitis).

Study Design

The study included a sample size of 31 cases, with an emphasis on the predictive value of X-ray PNS 45° (Water View) in diagnosing chronic sinusitis in patients presenting with typical symptoms.

Inclusion Criteria

Patients who reported symptoms such as rhinorrhea, nasal obstruction, headache, and facial pain—unresponsive to conventional medical management—and demonstrated radiological findings like mucosal haziness, sinus opacification, or air-fluid levels on 45° PNS (paranasal sinus) X-ray, were selected for inclusion in the study. Individuals with a history of prior nasal surgery were excluded.

Exclusion Criteria

Patients were excluded if they had the following conditions:

- Presence of nasal or paranasal tumors or polyps
- Allergic mucosal thickening in the middle meatus detected during clinical examination
- History of prior nasal surgery
- Age below 18 years or above 60 years
- Known allergy to lignocaine
- Diagnosed ischemic heart disease or any other severe systemic illness that may interfere with diagnosis or management

Data Collection

All patients who met the inclusion and exclusion criteria were evaluated at the outpatient department (OPD). X-ray PNS was performed on all participants to assess paranasal sinus conditions. The results were analyzed for signs of haziness, opacification, and air-fluid levels.

- Socio-demographic data such as age, gender, and previous medical history were documented for all participants.
- The study utilized a pre-tested, organized proforma designed specifically for this purpose to collect relevant data.

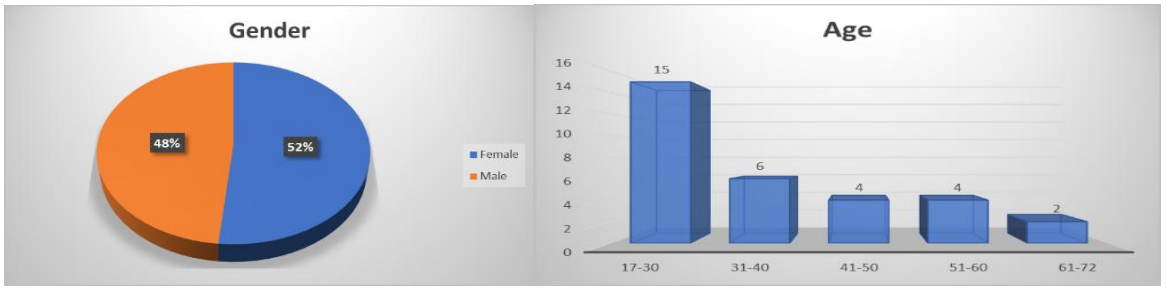
Statistical Analysis

The collected data were systematically entered into a structured database and analyzed using SPSS software (specific version to be mentioned). The participants' age was presented as a mean with standard deviation. Gender distribution, along with the positive predictive value (PPV) of the X-ray PNS (45° Water's view) findings, was expressed in terms of frequencies and percentages.

4. RESULTS

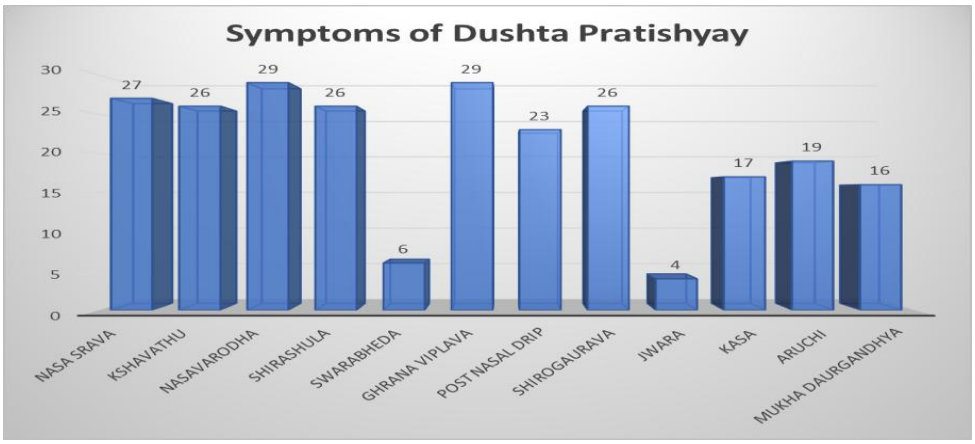
A total of 31 patients were included in the study during the specified period. Among them, 15 (48%) were male and 16 (52%) were female. The duration of symptoms varied, ranging from a few months up to five years (Fig. 1). The highest incidence was observed in individuals aged 17–30 years, corresponding to the third decade of life. Adolescents and elderly individuals were the least affected groups (Fig. 2).

Fig 1: Distribution of participants by gender **Fig.2: Distribution of cases according to age**

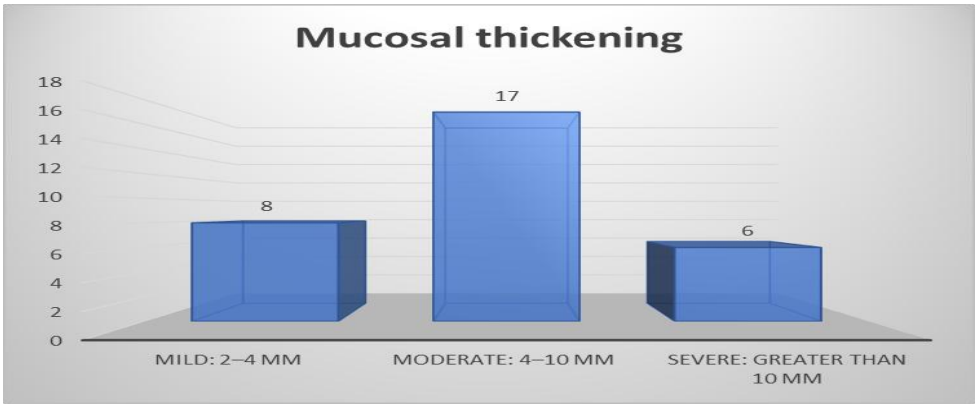


The most prominent clinical symptoms observed in the study population were **Nasaavarodha** (nasal obstruction) and **Ghrana Viplava** (olfactory disturbance), each reported by 94% of patients. **Nasa Srava** (nasal discharge) was present in 87% of cases, while **Kshavathu** (sneezing), **Shirashoola** (headache), and **Shirogaurava** (heaviness of the head) were noted in 84% of patients. **Post-nasal drip** was reported by 74%, **Aruchi** (loss of appetite) by 61%, **Kasa** (cough) by 55%, and **Mukha Daurgandhya** (halitosis) by 52%. Less common symptoms included **Swarabheda** (hoarseness of voice) in 19% and **Jwara** (fever) in 13% of patients (Table 1).

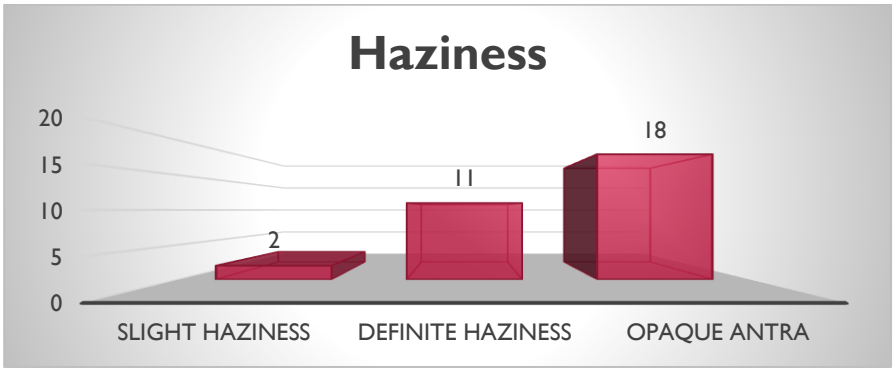
Cilincal features of the patients gone through history & physical examination (n=31)



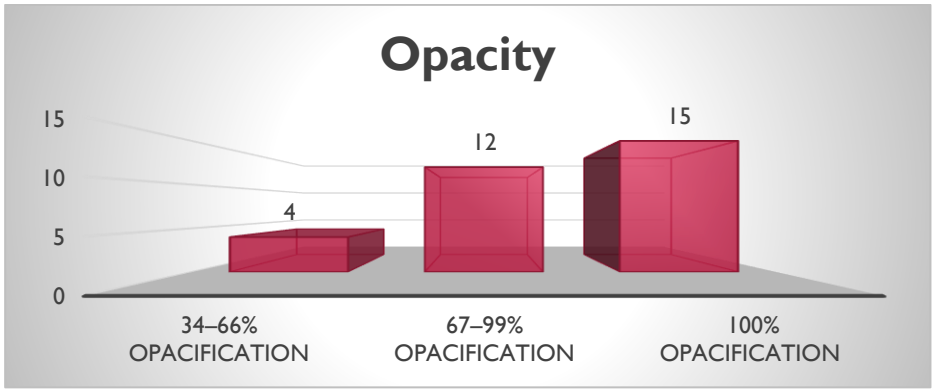
Digital Examination



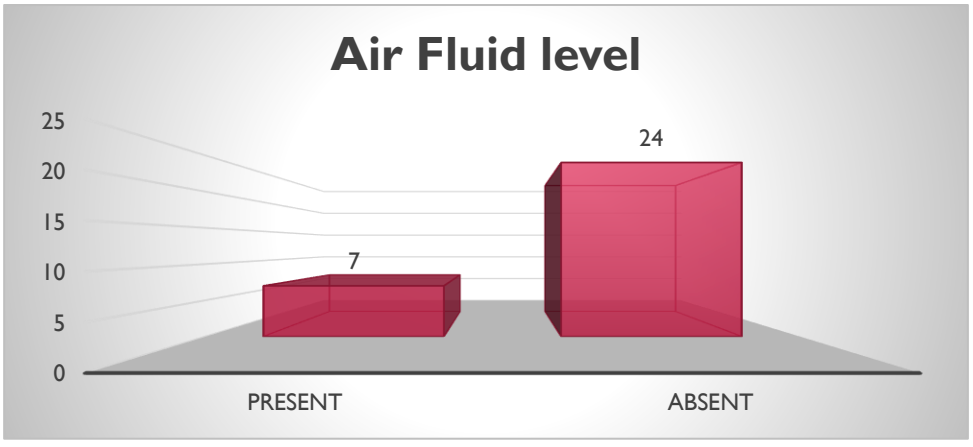
Interpretation: The data presented in the above table and figure indicate that all patients (100%) exhibited abnormal mucosal thickening on X-ray PNS 45° (Water's view). Among these, the majority of patients (55%) showed moderate mucosal thickening ranging between 4–10 mm. Mild thickening (2–4 mm) was observed in 29% of cases, while severe thickening (greater than 10 mm) was seen in 19% of patients. These findings suggest a consistent radiological abnormality across the sample population, reinforcing the diagnostic significance of mucosal thickening in chronic rhinosinusitis.



Interpretation: The above table and figure indicate that haziness was observed in 100% of the patients, confirming its presence as a common radiological finding in chronic rhinosinusitis. Among these, 58% of patients exhibited complete opacification (opaque antra), making it the most prevalent pattern. Definite haziness was noted in **36%**, while slight haziness was seen in **6%** of cases. These results highlight the diagnostic importance of radiographic haziness, particularly complete opacification, in evaluating sinus pathology.



Interpretation: The above table and figure demonstrate that opacity changes were present in all patients (100%), indicating their consistent association with chronic sinus pathology. Among these, complete (100%) opacification was observed in **48%** of cases, making it the most frequent finding. Partial opacification between **67–99%** was seen in **39%** of patients, while **13%** exhibited moderate opacification ranging from **34–66%**. These findings support the utility of assessing sinus opacity levels in the radiographic diagnosis of chronic rhinosinusitis.



Interpretation: The above table and figure reveal that air-fluid levels were present in 23% of patients, while 77% of patients showed an absence of air-fluid levels. This indicates that air-fluid levels, a hallmark of sinus infection, were observed in a minority of cases, suggesting a potential variance in the severity or stage of chronic rhinosinusitis among the study participants.

DISCUSSION

The interpretation of the findings is crucial for understanding the connection between Phana Marma and chronic rhinosinusitis (CRS). Based on the study results and statistical analysis, the following key insights can be drawn:

1. **Phana Marma and Its Anatomical Relevance:** Phana Marma's anatomical location in proximity to the cribriform plate and olfactory structures demonstrates its role in olfactory functions. The trauma to this Marma can directly affect the olfactory nerve and bulb, leading to anosmia. The presence of symptoms like "gandha agyan" (loss of smell) in patients correlates with damage to these critical anatomical sites, underlining the importance of Phana Marma in olfactory physiology.
2. **Chronic Rhinosinusitis (CRS) and Diagnosis:** The study highlights the role of the **45° PNS X-ray** as a key diagnostic tool for CRS, particularly in resource-limited settings. The X-ray findings, including haziness, opacity, and air-fluid levels, correlate with the symptoms observed in CRS, providing an essential diagnostic approach in the absence of advanced imaging methods like CT scans or MRIs.
3. **Chi-Square Test Results and Statistical Analysis:** By applying the Chi-square test of association, the study aims to determine the relationship between the symptoms of **Dushta Pratishyaya** (chronic rhinosinusitis) and **Phana Marma**. This analysis will provide statistical evidence regarding how strongly the presence of symptoms such as nasal obstruction, loss of smell, facial pain, and others, correlates with the anatomical and functional disruption of Phana Marma.

If significant associations are found, this would support the hypothesis that injury or dysfunction in Phana Marma is closely related to the clinical manifestation of CRS, particularly regarding symptoms like anosmia (loss of smell), nasal blockage, and facial pain.

This comparative anatomical study, alongside diagnostic imaging, offers valuable insights into how traditional Ayurvedic concepts of **Phana Marma** can correlate with modern clinical conditions like chronic rhinosinusitis, enhancing our understanding of both ancient and contemporary medical knowledge.

1) Association between number of symptoms of Dushta Pratishyay with Phana Marma and Mucosal Thickening: The result of chi square test is as follows

Number of symptoms of Dushta Pratishyay with Phana Marma	**Mucosal Thickening**			**Test Statistic**	**P value**
	Mild	Moderate	Severe		
6	7	0	0	35.014	<0.001
7	1	4	0		
8	0	4	2		
9	0	7	1		
10	0	2	2		
11	0	0	1		

Interpretation: The above table and figure reveal a clear relationship between the number of symptoms of Dushta Pratishyaya associated with Phana Marma and the severity of Mucosal Thickening observed in the patients. As the number of symptoms of Dushta Pratishyaya increases, the grade of mucosal thickening progresses from mild to severe. This indicates that a higher symptom load of Dushta Pratishyaya correlates with more significant changes in mucosal thickening, suggesting a worsening condition.

The statistical analysis, with a p-value < 0.05, confirms that this relationship is significant. This means that there is a strong association between the presence of more symptoms of Dushta Pratishyaya and the degree of mucosal thickening, supporting the hypothesis that as the clinical manifestations of Dushta Pratishyaya intensify, so does the severity of mucosal changes observed on radiological imaging (X-ray PNS). This result provides evidence that the Phana Marma's anatomical involvement is closely tied to the clinical progression of chronic rhinosinusitis (Dushta Pratishyaya) in these patients.

2) **Association between number of symptoms of Dushta Pratishyay with Phana Marma and Haziness:** The result of chi square test is as follows

Number of symptoms of Dushta Pratishyay with Phana Marma	Haziness			Test Statistic	P value
	Slight haziness	Definite haziness	Opaque antra		
6	0	2	5	5.792	0.832
7	0	1	4		
8	1	2	3		
9	1	3	4		
10	0	2	2		
11	0	1	0		

Interpretation: The above table and figure reveal that, unlike mucosal thickening, the grades of Haziness do not show a clear progression in correlation with the increase in the number of symptoms of Dushta Pratishyaya associated with Phana Marma. This suggests that the presence of more symptoms of Dushta Pratishyaya does not directly influence the degree of haziness observed in the X-ray images.

The statistical analysis, with a p-value > 0.05, indicates that there is no significant association between the number of symptoms of Dushta Pratishyaya with Phana Marma and the degree of Haziness. This result implies that while mucosal thickening may be a more reliable indicator of disease progression, haziness as observed in radiological images may not be strongly associated with the clinical symptoms of Dushta Pratishyaya or Phana Marma, suggesting that other factors could be influencing haziness in the sinuses.

Association between number of symptoms of Phana Marma and Opacity: The result of chi square test is as follows

Number of symptoms of Dushta Pratishyay with Phana Marma	Opacity			Test Statistic	P value
	34–66% opacification	67–99% opacification	100% opacification		
6	1	2	4	12.758	0.238
7	0	4	1		
8	0	3	3		
9	2	0	6		
10	1	2	1		
11	0	1	0		

Interpretation: The above table and figure reveal that, similar to haziness, the grades of Opacity do not exhibit a progressive change with an increase in the number of symptoms of Dushta Pratishyaya associated with Phana Marma. This indicates that the number of clinical symptoms related to Dushta Pratishyaya does not correlate with the degree of opacity observed in the sinus X-rays.

The statistical analysis, with a p-value > 0.05, indicates that there is no significant association between the number of symptoms of Dushta Pratishyaya with Phana Marma and the degree of Opacity. This suggests that opacity, as seen in radiological imaging, may not be directly influenced by the number of symptoms or the severity of Dushta Pratishyaya, pointing to the possibility that opacity in sinus images may be caused by other factors not directly related to the clinical presentation of the disease.

3) **Association between number of symptoms of Dushta Pratishyay with Phana Marma and Air fluid level:** The result of chi square test is as follows

Number of symptoms of Dushta Pratishyay with Phana Marma	Air fluid level		Test Statistic	P value
	Present	Absent		
6	1	2	5.647	0.342
7	0	4		
8	0	3		
9	2	0		
10	1	2		
11	0	1		

Interpretation: The above table and figure reveal that as the number of symptoms of Dushta Pratishyaya associated with Phana Marma increases, the presence of air-fluid level does not change accordingly. This suggests that the severity or number of symptoms related to Dushta Pratishyaya does not appear to have an effect on the presence of air-fluid levels in the sinus cavities.

The statistical analysis, with a p-value > 0.05, indicates that there is no significant association between the number of symptoms of Dushta Pratishyaya with Phana Marma and the presence of air-fluid levels. This finding suggests that other factors, possibly unrelated to the symptoms of Dushta Pratishyaya, may play a more prominent role in the development or absence of air-fluid levels in the sinuses.

5. CONCLUSION

In conclusion, Phana Marma occupies a critical anatomical position within the nasal cavity, linking the sensory functions of the olfactory system. Classified as an Urdhwajathrugatha Vaikalyakara Marma and Siramarma, its injury results in significant dysfunction, primarily anosmia (loss of the sense of smell). The anatomical relationship between Phana Marma and critical structures such as the olfactory bulb, olfactory nerve fibers, and the nasal mucosa provides strong support for the classical Ayurvedic concept of this Marma. Injury to the Phana Marma may result in damage to the cribriform plate, a key structure through which the olfactory nerve fibers pass. Disruption or fracture of this plate can sever the olfactory nerve fibers, leading to a loss of the sense of smell, known as anosmia. This correlation reinforces the Ayurvedic understanding of Phana Marma as being integral to olfactory function, and highlights the consequences of its injury in both traditional and contemporary medical contexts.The study confirms that Dushta Pratishyaya, as described in Ayurveda, exhibits clinical overlap with chronic rhinosinusitis (CRS), including similar signs, symptoms, and complications. Radiologically, air-fluid levels and opacity on X-ray PNS 45° serve as reliable indicators of sinus infection. In resource-limited regions like Patna, where advanced imaging technologies are often unavailable, the X-ray PNS 45° proves to be a valuable diagnostic tool. However, it is essential to emphasize that this method should not serve as a definitive diagnosis and must always be interpreted in conjunction with the patient's clinical history and symptoms.

Ultimately, the findings underline the importance of Phana Marma in understanding olfactory dysfunction and its implications for chronic rhinosinusitis. It further advocates for the continued use of affordable diagnostic methods like X-ray PNS 45° in rural and impoverished regions, with appropriate clinical correlation for accurate diagnosis and management.

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