

# Nasal headache

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## Objective

Identification of diagnosis and treatment of headache due to nasal pathology using subjective and objective criteria.

## Background

Headache is a very common manifestation that is nearly universal in the course of everyone's life, due to nasal pathology (nasal headache), or due to other causes (nonrhinogenic headache).

## Patients and methods

This prospective study was conducted among 225 patients with a symptomatic headache. All studied patients underwent otorhinolaryngologic examination and computed tomography scan for nasal/paranasal sinuses. After consultation with a neurologist, ophthalmologist, dentist, internist, and other related specialist, the patients were divided into two groups, A and B, as regards the origin of headache. Group A included nonrhinogenic headache cases, while group B included nasal headache cases (represent the core of this study). The mean, SD, and  $\chi^2$ -test was performed by the Statistical Package for the Social Sciences program for Windows, version 20. *P* values of less than 0.05 were considered statistically significant.

## Results

Group A included 125 nonrhinogenic headache cases, while group B included 100 nasal headache cases which were classified according to the cause of nasal headache regarding age and sex distribution, associated symptoms, response to medical and surgical treatment, whereas *P* values were 0.014, 0.155, less than 0.0001, less than 0.0001, and 0.195, respectively.

## Conclusion

Nasal pathology is the most common cause of headaches. Rhinosinusitis, allergic rhinitis, and deviated nasal septum, respectively, are the most common causes of nasal headaches.

## Keywords:

nasal headache, rhinogenic headache, rhinopathic headache

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## Introduction

Headache – as an annoying symptom – is defined as a pain reported of the head, usually above the eyebrows, which can be a disorder itself or caused by other disorders [1]. According to the International Headache Society, its classification is divided into three sections: primary, secondary, and headaches of other origin. The common primary headache disorders are migraine, probable migraine, tension type, and cluster headache whereas nasal headache is secondary to sinonasal pathology. A consideration of the diagnostic criteria International Headache Society encompasses useful signs and symptoms that help in the diagnosis of rhinogenic headache (Tables 1–3) [2]. Strictly rhinogenic headaches are headaches that have their primary pathophysiology centered in the nose and have headache as a secondary effect [3]. An otorhinolaryngologist is confronted as a rule with three different groups of headache patients: the first group, patients whose headaches are clearly related to sinus problems such as inflammatory disease, neoplasm, barotrauma, or another identifiable pathologies; the

second group included patients with headaches clearly connected to nonsinus causes, including migraine, neuralgias, cervical spine disorders, low or high blood pressure or other vascular disorders, allergy, or temporomandibular joint or ophthalmic problems; the third group included those who cannot be classified because of unidentifiable etiological factors [4,5]. Rhinologic causes of headache are twofold. The first is acute rhinosinusitis, be it frontal, ethmoid, maxillary, or sphenoid [6], where it can be caused by dysventilation of the paranasal sinuses, infections of the paranasal sinuses (bacterial rhinosinusitis, fungal rhinosinusitis), mucocoele, and neoplasms [1], and the second is any anatomic variations within the nose. Anatomic variations therefore causing headache are the following: septal deviations, in particular, a

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**Table 1 Headache attributed to acute rhinosinusitis [2]**

|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Descriptions        | Headache caused by acute rhinosinusitis and associated with other symptoms or clinical signs of this disorder                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Diagnostic criteria | Any headache fulfilling criterion C<br>Clinical, nasal endoscopic, or imaging evidence of acute rhinosinusitis<br>Evidence of causation shown by at least 2 of the following:<br>Headache has developed in temporal relation to the onset of the rhinosinusitis<br>Either or both of the following:<br>Headache has significantly worsened in parallel with worsening of the rhinosinusitis<br>Headache has significantly improved or resolved in parallel with improvement in or resolution of the rhinosinusitis<br>Headache is exacerbated by pressure applied over the paranasal sinuses.<br>In the case of a unilateral rhinosinusitis, headache is localized ipsilateral to it<br>Not better accounted for by another International Classification of Headache Disorders, Third Edition diagnosis |

**Table 2 Headache attributed to chronic or recurring rhinosinusitis [2]**

|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Descriptions        | Headache caused by a chronic infectious or inflammatory disorder of the paranasal sinuses and associated with other symptoms or clinical signs of the disorder                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Diagnostic criteria | Any headache fulfilling criterion C<br>Clinical, nasal endoscopic, or imaging evidence of current or past infection or other inflammatory process within the paranasal sinuses.<br>Evidence of causation shown by at least two of the following:<br>Headache has developed in temporal relation to the onset of CRS<br>Headache waxes and wanes in parallel with the degree of sinus congestion, drainage, and other symptoms of CRS<br>Headache is exacerbated by pressure applied over the paranasal sinuses<br>In the case of a unilateral rhinosinusitis, headache is localized ipsilateral to it<br>Not better accounted for by another International Classification of Headache Disorders, Third Edition diagnosis |
| Comment             | It has been controversial whether or not chronic sinus disease can produce persistent headache. Recent studies seem to support such causation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

spur which may contact either the middle or inferior turbinate; middle turbinate abnormalities, in particular concha bullosa, a paradoxically bent middle turbinate, or a hypertrophied middle turbinate; a prominent ethmoid bulla, in particular, if there is any contact area; agger nasi cells; and an abnormally bent uncinate process [6]. Stammberger and Wolf [4] postulated that stimulation of nasal mucosal receptors through the mucosal contact may result in the release of the neurotransmitter substance P. They hypothesized that this caused vasodilation and hypersecretion and induced referred pain via unmyelinated C fibers. Contact points between the lateral parts of the nasal

wall and septum could cause various headaches through the release of SP and its transfer via afferent C fibers to the cortex [4]. These headaches sometimes appear very similar to classic headaches such as migraine, cluster, and tension headaches. Contact points could be between the septum and any of the lower, middle, or superior turbinates and even ethmoid regions [4]. It is important for the otolaryngologist to evaluate the nose and determine whether this is indeed headache due to the nose or not [6]. Generally, rhinogenic pain is characterized as being dull, unilateral, severe, combined with a feeling of pressure and fullness, located on the same side as and related to rhinogenic symptoms like purulent rhinorrhoea. It may be exacerbated during an upper respiratory tract infection, during skiing or flying, and responds to antibiotic treatment. In acute cases there may be a pulsating pain, especially when the head is bent forward or when the patient is under physical stress. Rhinogenic pain is almost always accompanied by nasal endoscopic abnormalities [4,7]. Diagnostic endoscopy of the nasal passages and computed tomography (CT) of the nasal and paranasal region are complementary procedures. Diagnostic endoscopy is the best method of evaluating pathological changes such as retention of secretion, mucosal hypertrophy, and polypoid degenerations of the soft tissues at the contact points [5]. This study was carried out to identify the incidence, diagnosis, and treatment of headache due to the nasal pathology. This means how the otorhinolaryngologist can diagnose nasal headache by (full history taking/clinical examination and CT scan for nasal sinuses), how he can exclude causes of headache other than nasal pathology by consultation to related specialists, and how he treats this nasal headache (medically or surgically).

### Patients and methods

This prospective study was conducted on patients complaining of headache. All patients were chosen from the outpatient clinic at Menoufia University Hospital and Shubrakhit (Ministry of Health). Out of these patients, 225 patients were diagnosed to have a symptomatic headache to a significant degree during the period from January to October 2015. They were divided into groups A and B, as regards inclusion and exclusion criteria. Group A included nonrhinogenic headache cases, while group B included nasal headache cases (represent the core of this study). The two groups were compared for the incidence, age distribution, and sex. Group B cases were classified according to the cause of nasal headache. Inclusion criteria included patients of all age groups and sexes, history of acute or chronic headache, lack of acute or chronic inflammatory findings on the ear and throat examination, absence of

any other obvious cause of headaches after a thorough evaluation (by a neurologist, ophthalmologist, dentist, internist, and other related specialist), presence of nasal problem as documented by CT scan, whereas exclusion criteria included all cases presenting with clinical features other than nasal causes, for example, migraine, tension, psychogenic, metabolic, vascular, ocular, dental headache, etc.

All the 225 patients included in our study were subjected to full history taking, clinical otorhinolaryngologic examination, blood pressure assessment, and CT scan for nasal sinuses. The two groups were compared for the incidence, age distribution, and sex. Group B cases were classified according to the cause of nasal headache rhinosinusitis, allergic rhinitis, deviated nasal septum, nasal polyp, retention cyst, concha bullosa, or tumors (Figs. 1-8).

The study was approved by the Ethics Committee of the hospital and the patients gave informed consent.

Results

In this study, the incidence and demographic data of 225 patients are shown in Table 4, where group A included 125 (55.6%) nonrhinogenic headache cases, and group B included 100 (44.4%) nasal headache cases (represent the core of this study). The incidence and demographic data of nasal headache cases (group B) are shown in Table 5, where 42% of nasal headache cases had rhinosinusitis as follows (of that 33 cases had chronic sinusitis, 78.6%; six cases had acute sinusitis, 14.3%;

and three cases had acute on top of chronic sinusitis, 7.1%); 19% had allergic rhinitis; 18% had deviated nasal septum, 8% had nasal polyps, 6% had retention cyst, 5% had concha bullosa, and 2% had tumors. About 58% of the patients with headache due to nasal pathology were women and 42% were men ( $P = 0.155$ ).

Table 3 Headache attributed to disorder of the nasal mucosa, turbinates, or septum [2]

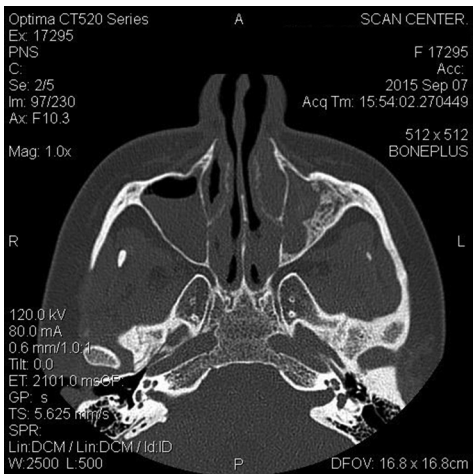
|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Diagnostic criteria | Any headache fulfilling criterion C<br>Clinical, nasal endoscopic, or imaging evidence of a hypertrophic or inflammatory process within the nasal cavity<br>Evidence of causation shown by at least two of the following:<br>Headache has developed in temporal relation to the onset of the intranasal lesion<br>Headache has significantly improved or significantly worsened in parallel with improvement in (with or without treatment) or worsening of the nasal lesion<br>Headache has significantly improved after local anesthesia of the mucosa in the region of the lesion<br>Headache is ipsilateral to the site of the lesion<br>Not better accounted for by another International Classification of Headache Disorders. Third Edition diagnosis |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Examples are concha bullosa and nasal septal spur.

Table 4 Age and sex distribution of the studied cases (demographic data) and incidence

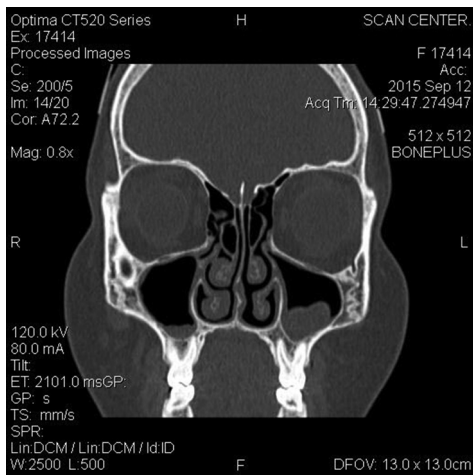
| Age and sex       | Nonrhinogenic headache | Nasal headache | $t$ or $\chi^2$ | $P$     |
|-------------------|------------------------|----------------|-----------------|---------|
| Age (years)       |                        |                |                 |         |
| Range             | 12-65                  | 11-78          | 4.822           | >0.0001 |
| Mean±SD           | 39.72±13.28            | 30.72±14.66    |                 |         |
| Sex [n (%)]       |                        |                |                 |         |
| Male              | 55 (44)                | 42 (42)        | 0.091           | 0.763   |
| Female            | 70 (56)                | 58 (58)        |                 |         |
| Total (incidence) | 125 (100)              | 100 (100)      |                 |         |

Figure 1



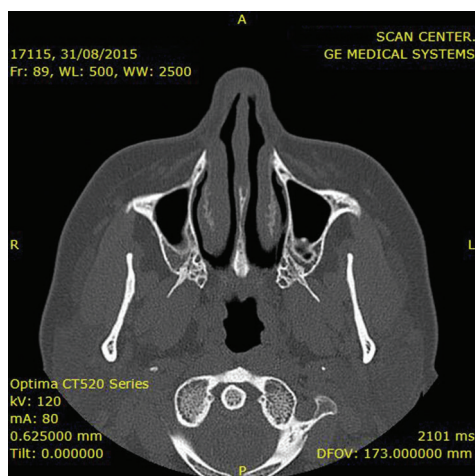
Acute on top of chronic rhinosinusitis. Near total opacification of the examined Paranasal Sinuses (PNS) by mucosal thickening and retained secretions with frothy appearance at the right maxillary sinus. Thickened nasal mucosa is also seen. Obstructed draining ostia. Normal bony outline of the sinuses. Central nasal septum, no spur. Normal computed tomography features of the nasal conchae. Normal cribriform plate of the ethmoid bones. Normal appearance of the nasopharyngeal airway.

Figure 2



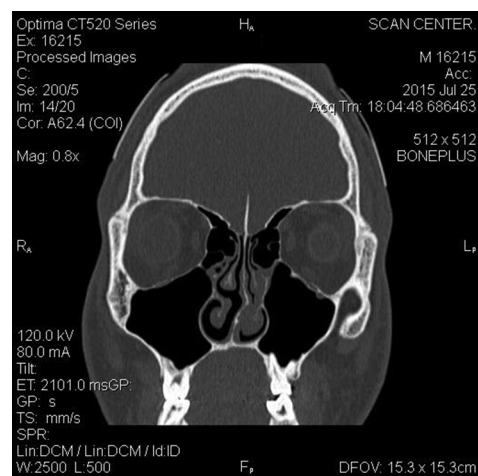
Chronic rhinosinusitis. Mucosal thickening of maxillary, right frontal, and right sphenoidal sinuses. Clear left frontal and left sphenoid sinuses as well as ethmoidal air cells. Patent draining ostia. Normal bony outline of the sinuses. Central nasal septum, no spur. Normal computed tomography features of the nasal conchae. Normal cribriform plate of the ethmoid bones. Normal appearance of the nasopharyngeal airway.

Figure 3



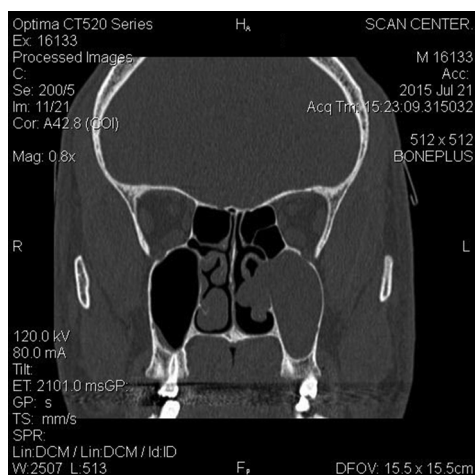
Chronic allergic rhinitis. Subtle mucosal thickening of the maxillary sinuses. Normal aeration of the other paranasal sinuses including sphenoidal sinuses as well as the ethmoidal air cells with no mucosal thickening and patent draining ostia. Normal bony outline of the sinuses. Slightly deviated nasal septum to the left side, no spur. Normal computed tomography features of the nasal conchae. Normal cribriform plate of the ethmoid bones. Normal appearance of the nasopharyngeal airway.

Figure 4



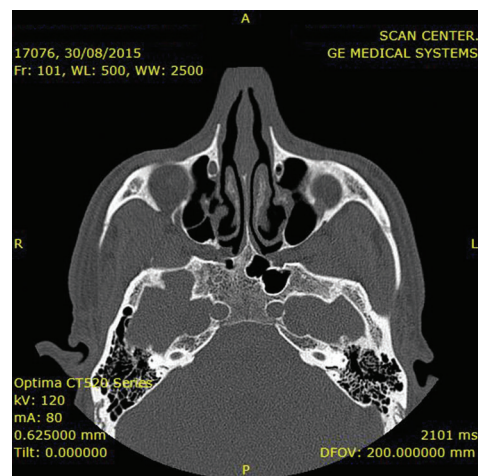
Deviated nasal septum to the left side. Normal aeration of the paranasal sinuses including maxillary, frontal, sphenoidal sinuses as well as the ethmoidal air cells. Normal bony outline of the sinuses with no mucosal thickening and patent draining ostia. Normal computed tomography features of the nasal conchae. Normal cribriform plate of the ethmoid bones. Normal appearance of the nasopharyngeal airway.

Figure 5



Antrochoanal polyposis. Total opacification of the left maxillary sinus by soft tissue polypoidal mucosal thickening extending to the left nasal cavity through the widened ostium to merge with the nasal conchae extending to the posterior choana and nasopharynx. Right maxillary mild mucosal thickening. Clear other paranasal sinuses with no mucosal thickening and patent their ostia. Normal bony outline of the sinuses. Central nasal septum, no spur. Normal cribriform plate of the ethmoid bones.

Figure 6



Left maxillary retention cyst. Mild mucosal thickening of the right frontal sinus. Small left side nasal septum spur. Normal aeration of the other paranasal sinuses including right maxillary, left frontal, sphenoidal sinuses as well as the ethmoidal air cells with no mucosal thickening and patent draining ostia. Normal bony outline of the sinuses. Normal computed tomography features of the nasal conchae. Normal cribriform plate of the ethmoid bones. Normal appearance of the nasopharyngeal airway.

The distribution of the nasal headache cases according to their ages by decades showed that most of the studied cases with nasal headache were in their third decade (34 cases, 34%) or second decade (23 cases 23%) consecutively, where the *P* value was 0.014 (Fig. 9).

The symptoms associated with nasal pathology alongside headache that were reported during examination of the studied nasal headache cases included nasal discharge, nasal obstruction, loss of smell, epistaxis, hyposmia,

and nasal itching (Table 6), wherein *P* values were less than 0.0001 for all.

This prospective study reported that 63% of the studied nasal headache cases responded well to medical treatment, while 37% did not improve (Table 7). Therefore, they underwent surgical treatment that included (functional endoscopic sinus surgery, septoplasty operation, or maxillectomy), where 34 (92%) cases improved remarkably and got rid of headache, wherein *P* values were less than 0.0001 and

0.195, consecutively (Table 8). All these results were recorded after follow-up.

## Discussion

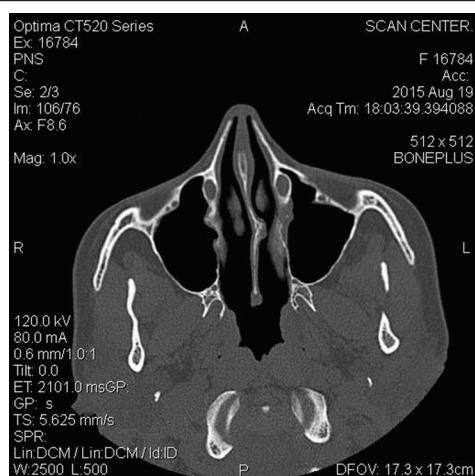
In our study, we did not find any significant difference between both groups regarding sex. Also in group B, there was not any statistically significant relationship between patient's sex and the causative rhinopathologies of this headache.

According to our results, 55.6% of the studied cases had nonrhinogenic headache (represents group A), while 44.4% had rhinogenic headache (represents the core of this study, group B). Concerning the incidence of nasal headache, we agree with the study by Kaur and Singh [8]. In that study, it has been reported that nasal pathologies are the most common causes of headache, where 100 patients with headache were

studied for a period of about 2 years, 69% of patients had headache due to rhinogenic causes vs 31% who had nonrhinogenic headache. Also, Yazici *et al.* [9] reported that the highest incidence of various primary headaches were with those who had underlying rhinologic abnormalities, where 73.7% of the studied cases with a primary headache had an intranasal pathological condition after undergoing physical examination by a neurologist and an otolaryngologist using rigid nasal endoscopy, sinus CT, and mucosal contact point test. However, Lee *et al.* [10] reported that tension-type headache is the most common type of headaches among the studied cases. In that study, only 28.7% of 1235 patients were complaining of headache, had secondary headaches due to rhinogenic problems vs 71.3% who had nonrhinogenic headache, where the cases whose had TTH represented 44.13% of all cases. Also, in the study by Foroughipour *et al.* [11], in the 58 patients who were diagnosed in the beginning as sinus headache by primary care physician, it was found that only 5% had sinogenic headache, while 68% had migraine and 27% had tension-type headache.

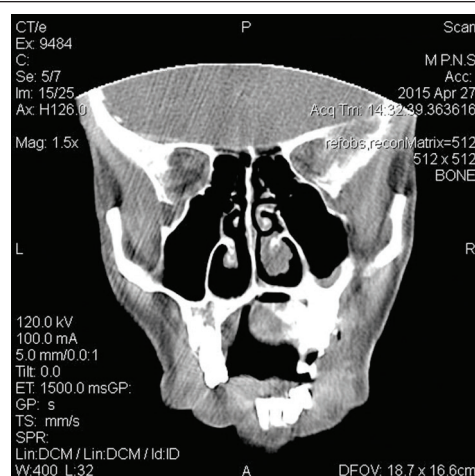
Our results in both groups showed a significant difference concerning age distribution. And about

**Figure 7**



Bilateral concha bullosa. Mild mucosal thickening of the maxillary sinuses encroaching upon the ostium of the left one. Subtle opacification of the ethmoidal air cells by retained secretions. Normal aeration of the other paranasal sinuses including frontal and sphenoidal sinuses with no mucosal thickening and patent draining ostia. Normal bony outline of the sinuses. Slightly deviated nasal septum to the left with no spur. Normal cribriform plate of the ethmoid bones. Normal appearance of the nasopharyngeal airway.

**Figure 8**



Right maxillary carcinoma. Normal nasopharynx. Clear left maxillary, ethmoidal, frontal, and sphenoid sinuses.

**Table 5 Age and sex distribution of the studied nasal headache cases (demographic data) and incidence**

| Nasal pathology   | Age (years) |             | Sex [n (%)] |            | Total Incidence |
|-------------------|-------------|-------------|-------------|------------|-----------------|
|                   | Range       | Mean±SD     | Male        | Female     |                 |
| Rhinosinusitis    | 11-78       | 31.02±13.60 | 14 (33.33)  | 28 (66.67) | 42 (42)         |
| Allergic rhinitis | 12-50       | 22.47±12.29 | 6 (31.58)   | 13 (68.42) | 19 (19)         |
| Deviated septum   | 14-60       | 32.39±15.48 | 8 (44.4)    | 10 (55.6)  | 18 (18)         |
| Nasal polyps      | 16-62       | 41.00±18.70 | 6 (75)      | 2 (25)     | 8 (8)           |
| Retention cyst    | 12-47       | 27.17±13.56 | 3 (50)      | 3 (50)     | 6 (6)           |
| Concha bullosa    | 21-43       | 32.40±08.11 | 3 (60)      | 2 (40)     | 5 (5)           |
| Tumors            | 51-55       | 53.00±02.83 | 2 (100)     | 0          | 2 (2)           |
| Total             |             |             | 42 (42)     | 58 (58)    | 100 (100)       |
| $\chi^2$          |             |             | 9.347       |            |                 |
| P                 |             |             | 0.155       |            |                 |

**Table 6 (Associated symptoms) distribution of the studied nasal headache cases**

| Associated symptoms | Nasal pathology [n (%)] |                   |                       |              |                |                |         | $\chi^2$ | P       |
|---------------------|-------------------------|-------------------|-----------------------|--------------|----------------|----------------|---------|----------|---------|
|                     | Rhinosinusitis          | Allergic rhinitis | Deviated nasal septum | Nasal polyps | Retention cyst | Concha bullosa | Tumors  |          |         |
| Nasal discharge     |                         |                   |                       |              |                |                |         |          |         |
| Yes                 | 42 (100)                | 8 (42.1)          | 1 (5.6)               | 8 (100)      | 6 (100)        | 5 (100)        | 0       | 73.45    | <0.0001 |
| No                  | 0                       | 11 (57.9)         | 17 (94.4)             | 0            | 0              | 0              | 2 (100) |          |         |
| Nasal obstruction   |                         |                   |                       |              |                |                |         |          |         |
| Yes                 | 1 (2.4)                 | 2 (10.5)          | 3 (16.7)              | 8 (100)      | 0              | 0              | 2 (100) | 60.82    | <0.0001 |
| No                  | 41 (97.6)               | 17 (89.5)         | 15 (83.3)             | 0            | 6 (100)        | 5 (100)        | 0       |          |         |
| Loss of smell       |                         |                   |                       |              |                |                |         |          |         |
| Yes                 | 31 (73.8)               | 11 (57.9)         | 1 (5.6)               | 5 (62.5)     | 6 (100)        | 0              | 0       | 37.32    | <0.0001 |
| No                  | 11 (26.2)               | 8 (42.1)          | 17 (94.4)             | 3 (37.5)     | 0              | 5 (100)        | 2 (100) |          |         |
| Epistaxis           |                         |                   |                       |              |                |                |         |          |         |
| Yes                 | 1 (2.4)                 | 0                 | 7 (38.9)              | 3 (37.5)     | 0              | 0              | 0       | 27.18    | <0.0001 |
| No                  | 41 (97.6)               | 19 (100)          | 11 (61.1)             | 5 (62.5)     | 6 (100)        | 5 (100)        | 2 (100) |          |         |
| Hyposmia            |                         |                   |                       |              |                |                |         |          |         |
| Yes                 | 1 (2.4)                 | 0                 | 0                     | 0            | 0              | 0              | 2 (100) | 66.45    | <0.0001 |
| No                  | 41 (97.6)               | 19 (100)          | 18 (100)              | 8 (100)      | 6 (100)        | 5 (100)        | 0       |          |         |
| Nasal itching       |                         |                   |                       |              |                |                |         |          |         |
| Yes                 | 0                       | 19 (100)          | 6 (33.3)              | 0            | 0              | 2 (40)         | 0       | 73.62    | <0.0001 |
| No                  | 42 (100)                | 0                 | 12 (66.7)             | 8 (100)      | 6 (100)        | 3 (60)         | 2 (100) |          |         |

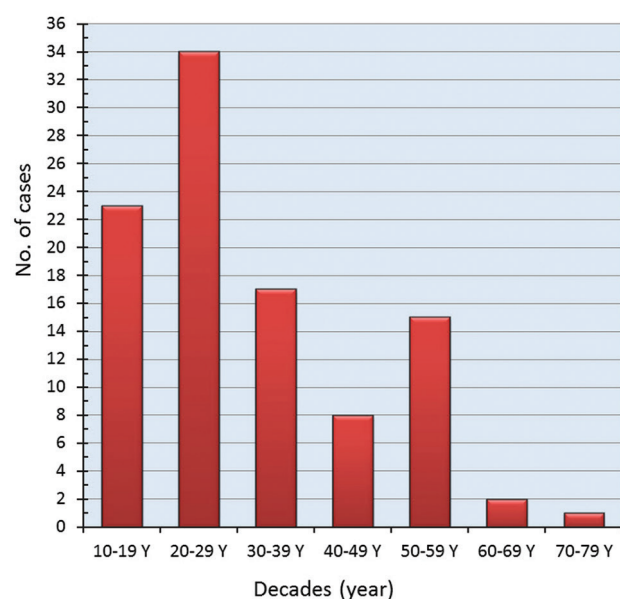
**Table 7 Response of the studied nasal headache cases to medical treatment**

| Nasal pathology   | Medical treatment [n (%)] |              | Total     |
|-------------------|---------------------------|--------------|-----------|
|                   | Improved                  | Not improved |           |
| Rhinosinusitis    | 36 (85.71)                | 6 (14.29)    | 42 (42)   |
| Allergic rhinitis | 19 (100)                  | 0            | 19 (19)   |
| Deviated septum   | 5 (27.78)                 | 13 (72.22)   | 18 (18)   |
| Nasal polyps      | 0                         | 8 (100)      | 8 (8)     |
| Retention cyst    | 3 (50)                    | 3 (50)       | 6 (6)     |
| Concha bullosa    | 0                         | 5 (100)      | 5 (5)     |
| Tumors            | 0                         | 2 (100)      | 2 (2)     |
| Total             | 63 (63)                   | 37 (37)      | 100 (100) |
| $\chi^2$          | 52.877                    |              |           |
| P                 | <0.0001                   |              |           |

**Table 8 Response of the studied nasal headache cases to surgical treatment**

| Nasal pathology   | Surgical treatment [n (%)] |              | Total      |
|-------------------|----------------------------|--------------|------------|
|                   | Improved                   | Not improved |            |
| Rhinosinusitis    | 4 (66.67)                  | 2 (33.33)    | 6 (16.22)  |
| Allergic rhinitis | 0                          | 0            | 0          |
| Deviated septum   | 13 (100)                   | 0            | 13 (35.14) |
| Nasal polyps      | 7 (87.5)                   | 1 (12.5)     | 8 (21.62)  |
| Retention cyst    | 3 (100)                    | 0            | 3 (8.1)    |
| Concha bullosa    | 5 (100)                    | 0            | 5 (13.51)  |
| Tumors            | 2 (100)                    | 0            | 2 (5.41)   |
| Total             | 34 (91.9)                  | 3 (8.1)      | 37 (100)   |
| $\chi^2$          | 7.361                      |              |            |
| P                 | 0.195                      |              |            |

distribution of the nasal headache patients according to their ages by decades, our results showed that most of the studied cases that complain of nasal headache were in their third or second decade, which represented 34 and 23%, respectively. Lee *et al.* [10] reported that the highest incidence of nasal headache was noted in the age group of 20–29 years (third

**Figure 9**

Age distribution of the studied cases with nasal headache by decades.

decade), followed by 10–19 years (second decade). Similarly, Kaur and Singh [8] reported that nasal headache can occur at any age. But the highest incidence was noted in the age group of 21–30 years, followed by 11–20 years. Concerning group B, we agree with that studies regarding age distribution by decades, as it represented statistically significant differences between age groups.

Our results showed that in group B, 42% of nasal headache cases had rhinosinusitis, 19% allergic rhinitis, 18% deviated nasal septum, 8% nasal polyps, 6%

retention cyst, 5% concha bullosa, and 2% had tumors. Lee *et al.* [10] reported that about 48.5% of patients who complain of acute headache due to rhinogenic problems had rhinosinusitis. Kaur and Singh [8] reported that about 28.9% of patients with headache had acute sinusitis; 28.9% of the patients had deviated nasal septum; 24.63% of the patients had osteomeatal complex disease; 8.69% of patients had polyps; 5.79% of patients had allergic rhinitis; and 2.89% of patients had atrophic rhinitis. We agree with that studies which reported that rhinosinusitis is the most common cause of nasal headaches.

As regards the distribution of symptoms associated with nasal headache, our results found that 70% of the studied nasal headache cases had nasal discharge, 54% had loss of smell, 27% had nasal itching, 16% had nasal obstruction, 11% had epistaxis, 3% had hyposmia, and 2% had facial numbness. We reported that nasal discharge is the most common symptom associated with nasal headache in the studied cases. Kaymakci *et al.* [12] reported that 92% of the studied patients presented with at least one symptom of nasal discharge, nasal obstruction, or sinus sensitivity as the most common associated features with sinus headaches. Also, Clifton and Jones [13], in a prospective observational study, reported that mucopurulent rhinorrhea (nasal discharge) is the most common symptom associated with sinogenic head pain in the studied cases. In that study, 84% of patients with Chronic Rhinosinusitis (CRS) who complained of head pain had mucopurulent rhinorrhea; 74% had nasal obstruction; and 68% had hyposmia. In a prospective study by Bektas *et al.* [14] in 2011, it has been found that all of the studied patients with contact point headache who had nasal obstruction and postnasal discharge represented 38.9 and 19.4%, respectively.

Concerning responsiveness of studied nasal headache cases to medical treatment, our results showed that 63% had significant relief and 37% had no benefit from medical treatment. Our results coincide with that concluded by Clifton and Jones [13]. They reported that the medical treatment achieves remarkable improvement in a significant proportion of nasal headache cases, where 61% of studied cases with sinogenic head pain became symptom free following medical treatment. However, Yazici *et al.* [9] reported that only 27.4% of the studied patients with a headache due to an intranasal pathologic condition responded to medical treatment.

Our results showed that the surgical intervention achieved remarkable improvement in a significant proportion in reduction of the frequency, duration, and intensity of headache associated with intranasal

pathologic conditions, where 91.9% of nasal headache cases had remarkable improvement after surgical intervention. However, we did not find any statistically significant relationship between the causative rhinopathologies of headache and patients' responsiveness to surgical treatment. We agree with the study by Senocak *et al.* [15]. In that study, it has been reported that there was not any statistical relationship between the presence of nasal complications and headache relief after surgery. Also, Mariotti *et al.* [16] conducted a study on 33 patients with rhinogenic headache who underwent operative treatment. They reported postoperatively that statistical analysis of the history and CT parameters revealed no patterns that might explain the difference between the patients who improved and those who did not improve. Various other studies in the literature showed similar results, where the success rates for surgery to reduce the frequency, duration, and intensity of headache associated with intranasal pathological conditions. Behin *et al.* [17], Tosun *et al.* [5], and Parsons *et al.* [18] had reported a success rate of %.

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### Conflicts of interest

There are no conflicts of interest.

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