CHAPTER 3

CONCEPT OF SINUSITIS
MODERN CONCEPT OF SINUSITIS

Definition:

Sinusitis is an inflammatory disorder of the nasal sinuses.\textsuperscript{1}

Nasal Sinuses:

Sinuses are the air-filled spaces in the skull behind the bones of face and forehead that open up into the nasal cavity.\textsuperscript{2} They are lined by mucous membrane and it produces a slimy secretion called mucus to keep the nasal passages moist and trap dirt particles. These sinuses make facial bones less dense and lighter in weight. Sinuses also play a role in the production of sound.\textsuperscript{2}

Para nasal sinuses are the paired cavities in the skull between the facial bones. There are four large sinuses; two above the eyes on either side of the forehead, the frontal sinuses and two inside the cheekbones, the maxillary sinuses. The paranasal sinuses are lined with mucous membranes that are continuous with the lining of the nasal cavity. There are smaller sinuses (ethmoidal and sphenoidal sinuses) located between the larger ones. Ethmoid sinuses located behind the bridge of the nose, between the eyes and Sphenoid sinuses between the upper part of the nose and behind the eyes.\textsuperscript{2} The following figures show the paranasal sinuses.
Description of Sinusitis:

The sinuses are lined with membranes that secrete antibody-containing mucus, which protects the respiratory passages from the onslaught of irritants in the air we breathe. Secretions produced by the mucous membranes of the
paranasal sinuses drain into the nasal cavity. An inflammation of the membranes due to an allergic reaction or infection is called sinusitis. If inflammation of the membranes blocks the drainage into the nasal cavity, fluid pressure builds up in the paranasal sinuses and a sinus headache results.\(^3\)

Inflammation can be caused by inhaling irritants, but is commonly due to infection. Such infections are usually caused by viruses that lower the resistance of the respiratory tract to other infections.\(^4\) This allows bacteria, dormant in the tract, to invade the tissues. Sinusitis is usually caused by spread of microbes from the nose and pharynx to the mucous membrane lining the paranasal sinuses. The primary viral infection is usually followed by bacterial infection. The congested mucosa may block the openings between the nose and the sinuses, preventing drainage of muco-purulent discharge. If there are repeated attacks or if recovery is not complete, the infection may become chronic.

Many primary headaches, particularly migraine or cluster, may closely resemble sinus headache. Migraine and sinus headaches may even coexist in many cases. Sinus headaches are usually more generalized than migraines, but it is often difficult to tell them apart, particularly if headache is the only symptom of sinusitis. Other conditions that can mimic sinusitis include:

- Dental problems
- A foreign object in the nasal passage
- Temporal arteritis (headache caused by inflamed arteries in the head)
• Persistent upper respiratory tract infections
• Temporomandibular disorders (problems in the joints and muscles of the jaw hinges)
• Vasomotor rhinitis, a condition in which the nasal passages become congested in response to irritants or stress. It often occurs in pregnant women.

Etiology:

Inflammation and swelling of the mucous membranes of the sinus cavities is what causes sinusitis.\(^5\) This in turn could be caused by infection or over stimulation of the mucous membranes of the sinuses by cold air during the winter season, especially during sleep when metabolism is low. Smoking reduces the effectiveness of the nasal muco-ciliary clearance by damaging the lining of the sinus. Poor systemic as well as local immunity in the sinuses are predisposing factors. A common provocation is nasal allergy. A deviated nasal septum adds to the problem. An allergic tendency of the entire system causes inflammation of the lining of the sinuses and subsequent infection. Common causes of sinusitis can be listed as below:

• Respiratory tract infections: Infections in respiratory tract, most commonly, cold can inflame and thicken the sinus membranes, blocking mucus drainage and creating conditions ripe for growth of bacteria. These infections can be viral, bacterial or fungal in nature.
• Allergens such as dust, pollen, pet dander; indoor air pollutants, such as cigarette smoke, rug shampoo and formaldehyde (used in the manufacture of carpeting, particleboard and plywood); and outdoor air pollutants all can induce inflammation. Symptoms of both sinusitis and allergic rhinitis include nasal obstruction and congestion. The conditions often occur together.

• Immune system: Lack of immunity with or without certain health conditions, immune cells called eosinophils can cause sinus inflammation.

• Nasal polyps or tumors: These tissue growths may block the nasal passages or sinuses and may lead to sinusitis.

• Deviated nasal septum: A crooked septum, the wall between the nostrils, may restrict or block sinus passages.

• Excessive dryness in homes and offices from dry-air heating and air-conditioning systems can also inflame the sinuses.

• Trauma to the face: A fractured or broken facial bone may cause obstruction of the sinus passages.

• Medical conditions such as complications of cystic fibrosis, gastroesophageal reflux, or HIV and other immune system diseases may result in nasal blockage.
Symptoms:

Pain and pressure in the face along with a stuffy or runny nose are the main symptoms of sinusitis. Sometimes it may associate with yellow or greenish discharge from the nose. Leaning forward or moving head often increases facial pain and pressure. The location of pain and tenderness may depend on which sinus is affected.

- Pain in the lower forehead, above the eyebrow, may be caused by frontal sinus inflammation. Symptoms aggravates when lying on the back.
- Pain over the cheeks and upper teeth is often caused by maxillary sinus inflammation. Symptoms are worse when head is upright.
- Pain behind the eyes, on top of the head, or in the face may be caused by sphenoid sinus inflammation. Symptoms aggravates when lying on the back or bending forward.
- Pain around or behind the eyes or sometimes redness and tenderness in the area across the top of the nose may be caused by ethmoid sinus inflammation. Symptoms aggravates when coughing, straining or lying on the back.

Other common symptoms of sinusitis include:

- Headache.
- Yellow or greenish discharge from the nose or down the back of the throat.
- Nasal congestion
• Stuffy nose.
• Loss of sense of smell
• Fever.
• Tooth pain.
• Reduced sense of taste or smell.

Less common signs of sinusitis include:

• sore throat
• snoring
• bad breath
• chronic throat clearing
• puffy eyes
• Cough that produces mucus.
• stuffy ears
• fatigue, irritability and depression
• a chronic cold
• asthma
• bronchitis

Types of Sinusitis:

• Acute (sudden) sinusitis: It is usually caused by a viral infection and often develops rapidly. It usually lasts for 4 weeks or less, and the symptoms often begin to clear up within a week without any treatment. Acute sinusitis caused by a bacterial infection is less likely to clear up on its own and may lead to chronic sinusitis or to complications in which the infection spreads beyond the sinuses. Nasal discharge that
contains pus and worsens after 5 days or persists for more than 10 days is usually a strong sign of acute sinusitis caused by a bacterial infection.5

- Chronic (long-term) sinusitis: It is usually caused by a bacterial or fungal infection. These infections are very difficult to treat by modern methods. Chronic sinusitis can lead to permanent changes in the mucous membrane that line the sinuses and may make more prone to sinus infections.5

**Role of Bacteria in Sinusitis:**

The role of bacteria or other infectious organisms is complicated in chronic sinusitis. They may have a direct, or an indirect role. In some patients, infectious organisms play no role at all. The bacteria most commonly implicated in sinusitis include the following.

- *Streptococcus pneumoniae*: This bacterium is found in 20 - 45% of adults and children with sinusitis.
- *H. influenzae*, a common bacterium associated with many upper respiratory infections.
- *Moraxella catarrhalis*: Over 75% of all children harbor this bacterium, which causes about 25% of sinusitis cases.

**Role of Fungi in Sinusitis:**

While fungi are an uncommon cause of sinusitis, the incidence of such infections is increasing. At least 5 - 10% of chronic rhino-sinusitis patients may
actually have allergic fungal sinusitis. Many patients with chronic sinusitis may be colonized with fungi, but this does not necessarily mean the patient has a fungal infection causing their symptoms. Some people who suffer from chronic sinusitis have an immune and inflammatory response to fungi and may benefit from anti-fungal treatment.7

Fungi involved in sinusitis include:

- Aspergillus is the most common cause of all forms of fungal sinusitis.
- Other fungi include Curvularia, Bipolaris, Alternaria, Dreschslera, Cryptococcus, Candida, Sporothrix, Exserohilum, and Mucormycosis.
- There have been a few reports of fungal sinusitis caused by Metarrhizium anisopliae, which is used in biological insect control.

**Risk factors:**

- A nasal passage abnormality, such as a deviated nasal septum, or nasal polyps
- Aspirin sensitivity that causes respiratory symptoms
- A medical condition such as cystic fibrosis or gastroesophageal reflux disorder (GERD)
- An immune system disorder such as HIV/AIDS or cystic fibrosis
- Hay fever or another allergic condition that affects the sinuses
- Asthma: about one in 5 people with chronic sinusitis have asthma
- Regular exposure to pollutants such as cigarette smoke
Complications:

- Osteomyelitis: Adolescent males with acute frontal sinusitis are at particular risk for severe problems. One important complication is infection of the bones (osteomyelitis) of the forehead and other facial bones. In such cases, the patient usually experiences headache, fever, and a soft swelling over the bone known as Pott's puffy tumor.

- Infection of the Eye Socket: Infection of the eye socket, or orbital infection, which causes swelling and subsequent drooping of the eyelid, is a rare but serious complication of ethmoid sinusitis. In these cases, the patient loses movement in the eye, and pressure on the optic nerve can lead to vision loss, which is sometimes permanent. Fever and severe illness are usually present.

- Blood Clot: Another danger, although rare, from ethmoid or frontal sinusitis are blood clots. If a blood clot forms in the sinus area around the front and top of the face, symptoms are similar to orbital infection. In addition, the pupil may be fixed and dilated. Although symptoms usually begin on one side of the head, the process usually spreads to both sides.

- Brain Infection: The most dangerous complication of sinusitis, particularly frontal and sphenoid sinusitis, is the spread of infection by anaerobic bacteria to the brain, either through the bones or blood vessels. Abscesses, meningitis, and other life-threatening conditions
may result. In such cases, the patient may experience mild personality changes, headache, altered consciousness, visual problems, and, finally, seizures, coma, and death.

- Increased Asthma Severity: The relationship between sinusitis and asthma is not clear. A number of theories have been proposed for a causal or shared association between sinusitis and asthma. Successful treatment of both allergic rhinitis and chronic sinusitis in children who also have asthma may reduce symptoms of asthma. It is particularly important to treat any coexisting bacterial sinusitis in people with asthma. They might not respond to asthma treatments unless the infection is cleared up first.

- Effects on Quality of Life: Pain, fatigue, and other symptoms of chronic sinusitis can have significant effects on the quality of life. This condition can cause emotional distress, impair normal activity, and reduce attendance at work or school.

**Diagnosis:**

Diagnosis of sinusitis is usually based on patient history and physical examination. A detailed history of the problem often can be of more value to the diagnosis than a physical exam. If the symptoms and physical findings are typical of sinusitis, further testing is usually not needed. Additional tests may be done if the diagnosis is not clear. The first goal in diagnosing sinusitis is to rule out other possible causes of symptoms, and then determine:
• The site where the infection has occurred
• Whether the condition is acute or chronic
• The organism causing the infection (if possible)

Patient History:

The patient should describe all symptoms such as nasal discharge and specific pain in the face and head, including eye and tooth pain. After assessing symptoms, a thorough medical history of the patient has to be taken.

• Any history of allergies or headaches
• Recent upper respiratory infection (colds, flues, infection)
• History of sinusitis episodes that is unresponsive to antibiotic treatment.
• Exposure to cigarette smoke or other environmental pollutants
• Recent travel
• Recent dental procedures, particularly if there is pain toward the back of the mouth
• Medications being taken (particularly decongestants)
• Any known structural abnormalities in the nose and face
• Injury to the head or face
• History of medical conditions, such as chronic fatigue syndrome or fibromyalgia, which can produce tender areas in the face or sinus regions and nonspecific symptoms of ill health
• Any family history of allergies, immune disorders, cystic fibrosis, or immotile cilia syndrome.8
Physical Examination:

One has to press the forehead and cheekbones to check for tenderness and check for other signs of sinusitis, including yellow or yellow-green nasal discharge. Similarly the inside of the nasal passages has to be checked using a device with a bright light to check the mucus and look for any structural abnormalities.

Laboratory Tests:

In some cases, tests may be used to detect the presence of immune factors in sinus tissues that would suggest persistent inflammation. Such findings would strongly suggest a chronic or allergic condition. Increased eosinophils suggest allergic condition and increase in ESR (Erythrocyte Sedimentation Rate) suggests an infection.

Nasal Endoscopy (Rhinoscopy):

Nasal endoscopy or rhinoscopy is now used for diagnosing chronic and recurrent acute sinusitis and for differentiating between allergies and acute sinusitis. It involves the insertion of a flexible tube into the nasal passage and the use of a fiber optic light that enables to see inside the sinuses. Endoscopy allows detection of even very small abnormalities in the sinuses. It can determine whether surgery is necessary and if medications have any effect. Bacterial cultures can also be taken from samples removed using endoscopy. An endoscopy instrument is shown below.⁹
Imaging Techniques:
Computer Tomography: Computed tomography (CT) scanning is the best method for viewing the paranasal sinuses. There is little relationship, however, between symptoms in most patients and findings of abnormalities on a CT scan. CT scans are recommended for acute sinusitis only if there is a severe
infection, complications, or a high risk for complications. CT scans are useful for diagnosing chronic or recurrent acute sinusitis and for surgeons as a guide during surgery. They show inflammation and swelling and the extent of the infection, including in deeply hidden air chambers missed by x-rays and nasal endoscopy. Often, they can detect the presence of fungal infections.\(^6\)

**X-Rays** : Until the availability of endoscopy and CT scans, x-rays were commonly used. They are not as accurate, however, in identifying abnormalities in the sinuses. For example, more than one x-ray is needed for diagnosing frontal and sphenoid sinusitis. X-rays do not detect ethmoid sinusitis at all. This area can be the primary site of an infection, some time that has spread to the maxillary or frontal sinuses.\(^6\)

**Magnetic Resonance Imaging** : Magnetic resonance imaging (MRI) is not as effective as CT in defining the paranasal anatomy and therefore is not typically used to image the sinuses for suspected sinusitis. MRI is also more expensive than CT. However, it can help to rule out fungal sinusitis and may help differentiate between inflammatory disease, malignant tumors, and complications within the skull. It may also be useful for showing soft tissue involvement.\(^6\)

**Sinus Puncture and Bacterial Culture** : Sinus puncture with bacterial culture is the gold standard for diagnosing a bacterial sinus infection. It is invasive, however, and is performed only when antibiotics have not worked. Sinus puncture involves using a needle to withdraw a small amount of fluid from the
sinuses. It requires an anesthetic and is performed by a specialist. The fluid is then cultured to determine what type of bacteria is causing sinusitis.\(^6\)

**Prevention:**

- The best way to prevent sinusitis is to avoid colds and influenza. If one cannot avoid them, the next best way to prevent sinusitis is to effectively treat colds and influenza.
- Maintaining good hygiene and preventing transmission
- Reduce exposure to allergens.
- Improve household ventilation by opening windows whenever possible.
- Use a humidifier in the home or office when the person has a cold.
- Sleep with the head of the bed elevated. This promotes sinus drainage.
- Use decongestants with caution.
- Avoid air pollutants (such as smoke) that irritate the nose.
- Eat a balanced diet and undergo regular exercises.
- Minimize exposure to persons with known infections.

**Management:**

The primary objectives for treatment of sinusitis are reduction of swelling, eradication of infection, draining of the sinuses, and ensuring that the sinuses remain open.

Treatment of Acute Sinusitis:

- Support treatment with saline nasal irrigation, decongestants, antihistamines, and expectorants are appropriate for a minimum of 7 - 10 days for patients with mild-to-moderate symptoms, and may be used for longer.
• Antibiotics are not helpful for patients with mild-to-moderate symptoms, so they should not be prescribed for at least first 7 days.

Treatment of Chronic Sinusitis:

• A broad-spectrum antibiotic (one that can eliminate a wide range of bacteria) may be helpful. Some patients benefit from prolonged therapy.
• A corticosteroid nasal spray and oral corticosteroids (such as prednisone) can be taken for patients who do not respond to nasal corticosteroids or for those patients who have nasal polyps. Prednisone is also used for patients who have allergic fungal sinusitis.
• Saline nasal irrigation (nasal wash using saline solution) can be helpful for removing mucus from the nose.
• If the condition improves after 1 - 2 months, antibiotics can be stopped. The patient should continue with both the steroid and saline nasal solutions. If there is no improvement after this time, surgery may be considered. For some people with chronic sinusitis, however, the condition is not curable, and the goal of treatment is to improve the quality of life.
• A thorough diagnostic work-up should be performed to rule out any underlying conditions, including but not limited to allergies, asthma, any immune problems, gastroesophageal reflux disorder, and structural problems in the nasal passages. If a primary trigger for chronic sinusitis can be identified, it should be treated or controlled if possible.
Antibiotic Use in the Treatment of Sinusitis:

Antibiotics generally help only a very small number of patients with persistent nasal discharge for at least 20 days. Even when antibiotics are helpful, benefits are modest in reducing the duration of infection. The intense and widespread use of antibiotics (not only for sinusitis but also for ear infections and other upper respiratory tract infections) has led to a serious global problem, which is bacterial resistance to common antibiotics. Antibiotics used for Sinusitis are mainly Penicillins like Amoxicillin (Amoxil, Polymox, Trimox, Wymox, or any generic formulation) and Amoxicillin-clavulanate (Augmentin), Cephalosporins, Macrolides and Azalides, Trimethoprim-Sulfamethoxazole, Fluoroquinolones (Quinolones), Lincosamides, Tetracyclines. Most antibiotics have the following side effects:

- The most common side effect for nearly all antibiotics is gastrointestinal distress.
- Antibiotics double the risk for vaginal infections in women.
- Allergic reactions can also occur with all antibiotics but are most common with medications derived from penicillin or sulfa. These reactions can range from mild skin rashes to rare but severe, even life-threatening, anaphylactic shock.
- Certain drugs, including some over-the-counter medications, interact with antibiotics; patients should inform the doctor of all medications they are taking and of any drug allergies.
Managing Sinusitis in Patients with Allergies:

In addition to decongestants, pain relievers, and expectorants, other remedies are available for who suffer from nonbacterial sinusitis during allergy season.

- **Anti-Inflammatory Drugs:** Nasal spray corticosteroids (commonly called steroids) are important for reducing the inflammatory response in the nasal passages and airways. They are important in the treatment of asthma and are now considered to be the most effective measure for preventing allergy attacks. Leukotriene-antagonists are also useful for sinusitis symptoms.

- **Antihistamines:** Antihistamine tablets relieve sneezing and itching and can prevent nasal congestion before an allergy attack. Because they thicken mucus and make it harder to drain out from the sinuses, they should not be used for sinusitis.

- **Immunotherapy using specially designed antibodies and vaccines**

Emergency Treatment:

Sinusitis caused by severe fungal infections or patients who show signs that infection has spread beyond the nasal sinuses into the bone, brain, or other parts of the skull need emergency care. High-dose antifungal chemotherapy or high dose antibiotics are administered intravenously, and emergency surgery is almost always necessary in such cases.
Corticosteroids for Chronic Sinusitis:

Corticosteroid Nasal Sprays like Triamcinolone (Nasacort, Mometasone furoate (Nasonex), Fluticasone (Flonase, Flounce), Beclomethasone (Beconase, Vancenase), flunisolide (Nasalide), and budesonide (Rhinocort). Although oral steroids can have many side effects, the nasal-spray form affects only local areas, and the risk for wide spread side effects is very low unless the drug is used excessively.

Surgery:

Surgery can unblock the sinuses when drug therapy is not effective or if there are other complications, such as structural abnormalities or fungal sinusitis. The simplest surgical approach is the insertion of a drainage tube into the sinuses followed by an infusion of sterile water to flush them out. Functional endoscopic sinus surgery (FESS) is the standard procedure for most patients requiring surgical management of chronic sinusitis or polyposis. The procedure allows correction of obstructions, including any polyp and ventilation and drainage to aid healing.

Balloon Sinuplasty is a type of surgical procedure threads a small balloon through the sinus passages. As the balloon is gently opened, the sinus passages expand and drainage occurs.

Endoscopy is now used in most cases of chronic sinusitis, but in severe cases, invasive surgery using conventional scalpel techniques to remove infected areas may be required.
YOGIC CONCEPT OF SINUSITIS

The great science of yoga is an unequalled gift to the mankind from India. Yoga has the potentiality to prevent and cure the diseases of both body and mind. One does not know what unknown diseases are in store for him in future. Therefore, the refinement in health should be such that one should feel the slightest change in his body. This is possible only by the regular yogic practices.

Yoga is a form of medicine. The fact that it can prevent and cure many ailments has been accepted. Therefore; it should not be viewed as an alternative system of medicine but as a primary form in those areas in which yoga alone is needed to cure ill health.\textsuperscript{10} That it can tackle many major illnesses non-invasively puts yoga in a different dimension from just being a stress-relieving panacea. Modern medicine uses bio-feedback as a stress-relieving technique, but yoga works on the inner senses and mind as a conscious process and is thus more direct in its approach. It is an automatic feedback system.\textsuperscript{10}

Poor lifestyle, too much of competition, excessive hurry-worry, wrong kind of eating and sleeping habits, mental and social conflicts lead to the health problems. Apart from the functional unity of different parts of the body, yoga believes in the close relationship between the body and the mind. Mental factors effect the functioning of different parts of the body, and vice versa.\textsuperscript{11} Holistic approach of yoga has the potentiality to heal the patients completely. \textit{Patañjali} says ‘yogāṅṇusthānadasuddhiksaye jñānadīptirāvivekakhyātēḥ’.\textsuperscript{12} It clearly emphasizes that by following different parts of the yoga, the
impurities of both body and mind can be destroyed. Sinusitis is an inflammatory disorder. Therefore naturally there will be impurities in the sinuses. These impurities can be removed by proper yogic techniques. *Hathapradīpikā* explains that neti and kapālabhāti are the major kriyās which are beneficial to remove the impure kapha from the sinuses and to maintain healthy sinuses. Before going to the yogic concept of sinusitis in detail, let us see the concept of sinusitis explained in ancient Indian texts which are used by Ayurveda.

Detailed explanations about the disorders of nose and head and their treatment can be seen in Indian ancient texts like *Astānga Hrdaya* and *Charaka samhitha*. Vāghbhata explains the knowledge of diseases of the nose (Nāsā Roga Viṃśanīya) and their treatment (Nāsā Roga Pratisedha) in *Astānga Hrdaya Sūtra Sthāna*. He further explains the knowledge of the diseases of the head (Śīrōga Viṃśanīya) and their treatment (Śīrōga Pratisedha). He says exposure to dew (mist, fog), breeze and dust, too much of speaking, sleeping and keeping awake, keeping the pillow either very low or very high under the head, drinking more quantity of water, indulging more in water sports, suppression of vomiting and tears etc are the causes of the diseases of nose. He further explains the symptoms of ‘nāsā roga’ caused by vāta, there appears dryness of the mouth, profuse sneezing, blocking of the nose and pricking pain; pain in the teeth, temples and head, feeling of insects crawling around the eyebrows, weak voice, delayed ripening, discharge of cold and thin fluid from the nose. In that caused by pitta, there is thirst, fever, possibility of
eruptions developing inside the nose, giddiness, ulceration of the nasal tip and discharge of fluid which is dry (non-sticky) warm, coppery or yellow in colour. In that caused by kapha, there is cough, loss of taste, dyspnoea, vomiting, feeling of heaviness of the body, sweet taste in the mouth, itching (in the nose) and discharge of unctuous (sticky) white fluid. Treatment for different types of nasal diseases along with nasal medication (Nasya Vidhi) and inhalation of smoke (Dhūmapāna Vidhi) is explained in Astānga Hṛdaya Sūtra Sthāna.

Health and physical fitness through yoga is an area rapidly attracting the attention of the public nowadays. Health is not a static state; it is dynamic, ever changing. We can never claim that we are always healthy, but only that we are healthy at a particular moment. Health is like a live wire. At the moment we feel it, the sensation is energizing. Absence of it is a state when the body and mind are dull and slow. Body can dysfunction any time. Disease exists when health does not. Disease literally means dis-ease, means lack of ease in body and mind. Yoga can be used as a therapeutical science, which can cure the diseases and useful as a preventive therapy since it prevents the manifestation of the both physical and mental disorders by increasing the resistance of the body and by maintaining mental health.

In case of sinusitis, it is clearly the stagnation of the impurity on the air filled cavities of the skull. By adopting the yogic techniques properly, these impurities of the sinuses can be removed and further stagnation can be prevented. The resistance of the body against the causative factors can be
improved. Let us discuss the importance of each part of yoga with respect to sinusitis.

**Life style:**

Majority of the disorders nowadays are psychosomatic. Sometimes, the mental stress can congest the nasal mucosa and itself can become the cause for the manifestation of sinusitis. Mental stress or strain reduces the proper blood supply to the sinuses and in turn drainage will not be proper. This increases the accumulation of impurities in sinuses, which increases pressure on the sinuses leading to pain. Most of the psychosomatic problems are because of the improper life style. Improper lifestyle disturbs normal body functions and reduces the body resistance against the allergens; climatic changes and pollution. Yoga educates us to develop the proper life style.

Life style includes each and every activity that one does including the food that he eats and the sleep. The life style, how we live in society and how we live ourselves effects on our mental and physical state. Therefore, the good life style we adopt, the better our physical and mental health will be. Even getting up very late in the morning affects the functions of respiratory system and whole body and it can imbalance the *kapha* and can lead to sinusitis condition. If we get up late, we will be less active and the ‘*Kapha dosa*’ in the body will increase and we are more prone to ‘*kapha dosa*’ related problems. Sinusitis is one of such problems. Therefore it is better to get up early; at least before sunrise, so that when we start to do our daily routine works after getting up that should help to melt the *kapha* which is aggravated in the last part of the
night. After getting up in the morning passing stools is a healthy habit so that we can excrete the major waste materials from the body. To pass the stool in time one has to take proper food in proper time with proper proportions. This is necessary to maintain healthy digestion of the food that we eat. If the food, which is eaten, is not digested properly, it will increase the waste materials inside the body. Similarly the excess food eaten will be converted into fat and gets deposited in different parts of the body and in turn imbalances the ‘kapha’ dosa in the body. Such aggravated conditions of the ‘kapha’ dosa, can manifest Sinusitis. Therefore, concept of ‘mitāhāra’ can be adopted to maintain healthy sinuses.

A sinusitis patient better not to expose himself to the climatic changes, pollution, allergens such as dust, pollen grains, smoke, chemicals etc. since they trigger and aggravate the sinusitis condition. Similarly he should reduce intake of cold items, curd, junk food, oily, spicy food items and kapha aggravating food items to control the sinusitis. Excess use of air-conditioners may also congest the nasal mucosa and may become the cause for sinusitis. So use of air conditioners should be reduced in the case of sinusitis. Good nutritious food should be consumed to keep healthy sinuses. Pitta stimulating and kapha reducing herbs like ginger, pepper, long pepper and other food items can be consumed to maintain balance of kapha and pitta dosa in the body.
Kriyā:

*Kriyās* are the wonderful techniques of *Hathayoga*, which help to eliminate the excess fat and phlegm and thereby purify the body. “*medah ślesmādhikah pūrvam satkarmāni samācaret*”\(^{32}\) says the *Hathapradīpikā*. *Kriyas* help to reduce the excess *kapha* in the body in case of sinusitis. Simultaneously they improve immune system of the body to fight against the allergens and climate changes. Excess production of ‘ślesma’ and impurities inhaled through breathing will be transformed to the air filled cavities, the sinuses. Excess mucous and impurities cause the inflammation of sinuses, which will lead to the symptoms like headache, nasal congestion, heaviness of the head etc. This infected ‘ślesma’ can be removed by the practice of *kriyas*. Classical texts explain that *neti*\(^{33}\) and *kapālabhāti*\(^{34}\) are the important *kriyās* which are beneficial to maintain healthy sinuses. *Śvātmārāma* in *Hathapradīpikā* says,

> “*kapālaśodhanīcaiva divyadrstipradāyinī* [jātrurduḥvajātarogaugham netirāsu nihanti ca] [\(^{33}\) ]” &

> “*kapālabhātirvikhyātā kaphadosaviśosani* [\(^{34}\) ]”

Gheranda Samhita says that *vaso-dhauti kriya*\(^{35}\) and *neti kriya*\(^{36}\) help to cure the disorders of phlegm. It also explains the techniques of three types of *bhālabhāti kriyā* to cure the disorders of phlegm\(^{37}\).

The *jalaneti kriyā*, using saline water, helps to remove the infected ślesma from the nasal sinuses. The ślesma slowly drain from the sinuses due to the process of osmosis. Practice of *kapālabhāti after jalaneti kriya*, expels the
stagnated phlegm and dries up the nasal sinuses by increasing the temperature. Thus, this practice also increases the resistance of the nasal mucosa against the allergens and microorganisms. Sūtraneti is one of the powerful cleansing techniques of hathayoga which clears the nasal passages and hardens the nasal mucosa to resist against the infective particles. Therefore sūtraneti effectively works as a preventive and curative practice of yoga against the ‘kapha’ disorders like sinusitis. Dhauti kriya may be practiced in the chronic sinusitis conditions. This practice removes excess ‘kapha’ from the digestive tract starting from mouth to stomach. Reduction in ‘kapha’ from the body naturally helps to reduce the sinusitis. Similarly, dhauti kriya stimulates the digestive power which in turn helps to relieve the aggravated ‘kapha’ from the body. Other kriyas like Vahnisāra and nauli also increase the pitta which increases the digestive capacity and indirectly decreases the aggravated kapha from the body.

Āsana:

Āsana, the physical posture, can be attained by the systematic movement of body parts along with the synchronization of the breathing. Patañjali says it has the capability to achieve ‘dvandvānabhīghātah’. According to Hathayoga, āsana being the first limb, which brings mental as well as physical steadiness, health and lightness to the body. Āsana practice increases resistance of the body against the infection.

Physiologically speaking, āsana practice makes the blood circulation proper throughout the body. This enhances the purification of blood and
removal of impurities from different parts of the body. Sinusitis is the case of stagnation of impure mucus inside the sinuses. Practice of āsanas improves micro blood circulation to the area of sinuses which increases the purification process inside the sinuses and enhances the drainage by removing the infected mucus from the sinuses. The combination of suitable āsanas makes the circulation and purification proper in the infected sinuses and nasal passage. Āsanas like simhāsana help to remove the congestion on the nasal mucosa and sinuses. Āsanas like paścimatānāsana, trikonāsana, parśvakonāsana, bharadvājāsana, ardhamsyendrāsana increase the ‘jatharāgni’ and thereby help to melt the excess phlegm in the body. In turn the infected mucous inside the sinuses also starts to drain away. Viparītakarani is a wonderful practice which enhances the purification process of the sinuses by improving the circulation quickly and effectively to the sinus areas. At the same time it kinders the digestion, decreases ‘kapha’ in the body. Halāsana helps to open the congested nasal mucosa and so that the drainage can be improved quickly. Āsanas like bhujangāsana and dhanurāsana stretch and expand the lungs and other organs of the respiratory system. This helps in relieving the congestion in the nasal mucosa and sinuses. Thus proper practice of different āsanas helps to maintain proper circulation throughout the respiratory system and helps to maintain healthy sinuses.

**Pranāyāma, Bandha and Mudra:**

*Hathapradīpikā* says by regulating the breathing the mental activities can be controlled. Therefore the psychosomatic effect can be reduced by the
proper practice of pranāyāma in case of sinusitis. Sometimes, without any external causes, only the mental conditions like stress or depression may trigger the sinusitis condition. In such cases to overcome the psychosomatic effect, pranāyāma can play the major role. Pranāyāma helps to improve the body resistance against the causative factors. Similarly, pranāyāma helps to regulate kapha and pitta in the body. Regular practice of anuloma viloma pranāyāma helps to balance the autonomous nervous system functions and helps to maintain homeostasis within the body.\(^{47}\) Hatha pradīpikā says Sūryabedhana \(^{48}\) is an excellent practice among ‘astakumbhakas’ which cleanses the frontal sinuses and overcomes the disorders of vāta & diseases caused by worms.

\[
\text{kapālaśodhanam vātadosaghnam krimidosahrt |} \\
\text{punahpunaridam kāryam sūryabhedanamuttamam||}^{48}
\]

Practice of Sūryabhedana pranāyāma activates the functioning of sympathetic nervous system\(^{47}\) and which increases the digestive power and helps to reduce the Kapha dosa from the body. Ujjayī pranāyāma also helps to overcome the disorders caused by phlegm and increases the gastric fire.\(^{49}\) Bhastrikā pranāyāma cures the diseases caused by the imbalance of Vāta, Pitta and Kapha and this pranāyāma also increases the gastric heat. “vātapitta ślesmaharam sarīrāgni vivardhanam” says Hathapradīpikā\(^{50}\). Regular practice of Śītalī pranāyāma prevents the disorders of phlegm according to Gheranda Samhitā.\(^{51}\)

Jālandhara bandha \(^{52}\) helps to maintain healthy sinuses by overcoming the problems of imbalanced kapha. Udyāna bandha \(^{53}\) helps to aggravate
jatharāgni and there by helps to reduce aggravated kapha from the body. Pranāyāma can give better results when bandhas properly adopted in practice to facilitate the ‘kumbhakas’, which can be practiced after mastering āsanas. Viparītakarani 45 and Mahāmudrā 54 are the powerful mudra practices of yoga which help to maintain healthy sinuses.

**Meditation**

Meditation helps to maintain healthy mind. Therefore, whenever there is an influence of mental afflictions in case of sinusitis, meditation works very well. Mental stress reduces the microcirculation to the sinuses. 27 Whenever stress is reduced by meditation, the microcirculation will be improved. To maintain continuous one pointed concentration in meditation, one has to practice āsanas and pranāyāmas and then only one can get the maximum benefit of meditation. Regular practice of meditation is useful to prevent the sinusitis. Meditation techniques like Soham meditation and Om meditation help to reduce the effect of mental causes of sinusitis.

**Relaxation practices**

Relaxation techniques are necessary to rejuvenate the respiratory and digestive functions after cleansing and activating the sinuses by other yogic practices. Relaxation practices like śavāsana or yoganidra relax both the body and mind. “śavāsanam śrāntiharam cittaviśrāntikārakam” says Hathapradīpikā. 55 Therefore, relaxation practice has to be practiced at the end of all other yogic practices to maintain healthy sinuses.
Concept of Sinusitis according to basic principles of Yoga therapy

According to pañcakośa theory, we can find the imbalance of annamaya kośa, prānamaya kośa and manomaya kosa in case of sinusitis. The food which is eaten, if not digested properly can increase the impurities like ślesma inside the body. Similarly sluggish digestion will lead to decrease in resistance of the body. Therefore digestion has to be made proper by increasing digestive power by using yogic practices. Practices like paścimatānāsana⁴³, trikonāsana, parśvakonāsana, ardhamatsyendrāsana⁴⁴, viparītakaranī⁴⁵, halāsana help to increase the digestive power by giving massaging action and improving circulation to intra abdominal organs. Sūryabhedana Pranāyāma increases the digestion by stimulating the activity of sympathetic nervous system.⁴⁷ Forceful continuous breathing in bhastrikā pranāyāma helps to expel the impurities from the upper respiratory system. Similarly it increases the digestive capacity by rapid movement of the abdominal muscles. The lungs get proper oxygen supply and enhance the purification process by removing the carbon dioxide and other impurities quickly. The temperature raised in mucous membrane by Bhastrikā Pranāyāma facilitates the drainage of the excess mucous from the sinuses and nasal mucosa. Yogic practices increase the resistance of the nasal mucosa against the allergens and other foreign materials which can cause the infection of the nasal sinuses. Similarly good, nutritious, easily digestible food should be consumed to keep the annamaya kośa healthy. Consumption of the hot food items helps to melt the excess phlegm in the nasal passages and sinuses.⁵⁶ One has to avoid over eating, oily food, cold items, and excess sweet
or salty items to keep the sinuses healthy. Fresh fruits like orange are beneficial since they increase the resistance against the infections.

The prānamaya kośa gets affected because of the nasal blockages. This blockage can be removed by the practice of neti kriya, which cleanses the nasal passages and sinuses. After neti kriya, practice of kapālabhāti clears and dries the nasal passages and keeps frontal sinuses healthy. This enhances the proper movement of the prāna through the nose. The practice of pranāyāma improves the health of prānamaya kośa. This not only overcomes the problems like sinusitis but also helps to prevent further infections by increasing the resistance. Manomaya kośa will be affected whenever there is an influence of mind in case of sinusitis. Usually mental stress leads to vaso-constriction which reduces the microcirculation. In such cases it can be normalised by the proper practice of pranāyāma and meditation techniques. They help to normalize the mind by giving soothing and relaxing effect to the brain. Anuloma viloma pranāyāma helps to overcome the imbalance of autonomous nervous system, which is common in psychosomatic diseases. Chandrabhedana pranāyāma relaxes the mind by stimulating the functioning of the parasympathetic nervous system. Meditation practices help to reduce the effect of mental causes by continuous one pointed concentration on a particular object. Relaxation techniques like śavāsana or yoganidra, relax the body and mind, which are highly beneficial whenever sinusitis is psychosomatic.

Jñānendriyas and Karmendriyas are linked with Pañcamahābhūta, through citta, which is the combination of Mahat, Ahankāra and Manas. This
is the basic concept of yoga therapy according to Sadvimsati tatva theory. In case of sinusitis, prthvi and ap mahabhutas are imbalanced. Similarly the tejas tatva decreases, the ākasa tatva also, gets imbalanced. Relatively the kapha dosa increases and pitta dosa decreases in the body. So the digestion becomes poor and transformation of rasa dhātu to rakta dhātu is affected. In turn the ‘ślesma’ production will be increased by the influence of ap and prthvi tatvas. Functioning of the related jñānendriyas, nose and tongue, will be affected. The ability of smelling will be reduced and the person may get obstructions in breathing. Tastelessness may be the associated symptom related to tongue. Similarly the functioning ability of the excretory and sex organs may be effected. The reduction in tejas mahabhūta can be easily felt on the eyes. Pain in the eyes is one of the symptoms of sinusitis. Some times it may affect the vision also. Similarly the karmendriya, ‘pāni’ will be affected and naturally the working efficiency will decrease. In some cases of sinusitis, the ākāsa mahabhūta also gets affected. It can be felt by the disturbance in the ears and in the speech. Entities like Manas, Buddhī and Ahankāra influence on the pañcamahabhūta and indriyas indirectly. Therefore, sometimes the imbalance of these entities may manifest sinusitis.

The aim of yoga therapy is to balance the mahabhūtas along with sensory and motor organs. It can be done by decreasing the ap and prthvi tatva and increasing the tejas tatva. Yogic kriyas like neti, dhauti and kapālabhāti are highly beneficial to decrease the excess of ‘ap’ and prthvi tatva and help to increase the tejas mahabhūta. Āsanas like simhāsana, trikonāsana,
pārśvakonāsana, paścimottānāsana, bhujangāsana, bhāradvājāsana, ardhamatsyendrāsana, viparītakaranī mudrā, halāsana can be practiced to increase tejas tatva and to reduce the prthvi and ap tatva. Sūryabhedana prānāyāma stimulates the digestive power. Similarly, bhastrikā prānāyāma may help to balance the mahābhūtas. Once the pañcamahābhūtas are balanced, related sensory and motor organs function properly. Prānāyāmas and meditation practices help to regularize buddhi, manas and ahankāra.

According to tridosha theory, sinusitis is a kapha-pitta disorder, where usually the kapha dosa aggravates or becomes imbalanced and pitta dosa gets reduced. Reduction of pitta dosa in the body directly affects the digestion. Digestive power will be decreased and this may lead to indigestion. The transformation of ‘food’ to ‘rasa’ dhātu will not be proper and which may leads to the excess secretion of ‘ślesma’ mala. Naturally excess ‘ślesma’ will affect the upper portion of the body, especially to the respiratory system.

Excess production of ‘ślesma’ along with impurities will be transformed to the air filled cavities, the sinuses. This impure mucous produces the inflammation of the sinuses, which increases the pressure inside the sinuses leading to the symptoms like head ache, nasal congestion, heaviness of the head etc. Therefore, reduction in pitta dosa may aggravate the inflammation of the nasal sinuses by reducing the immunity. Yoga therapy aims to increase the immunity by improving digestive capacity. This can be done effectively by yogic practices. Of course, first of all, the accumulated ‘kapha’ has to be removed by the practice of kriyas. References show that neti and kapālabhāti
are the wonderful practices which are beneficial to maintain healthy sinuses.\textsuperscript{57} The \textit{jalaneti kriya} using saline water helps to remove the infected ślesma from the nasal sinuses. Practice of \textit{kapālabhāi} after \textit{jalaneti kriya}, expels the stagnated phlegm and dries up the nasal sinuses by increasing the temperature. This practice also increases the resistance of the nasal mucosa against the allergens and microorganisms. \textit{Śūtraneti} is one of the wonderful cleansing techniques of \textit{hathayoga} which clears the nasal passages and strengthens the nasal mucosa to resist the infective particles. Therefore \textit{śūtraneti} effectively works as a preventive and curative practice of yoga against the ‘\textit{kapha}’ disorders like sinusitis.\textsuperscript{33} \textit{Dhauti kriya} may be advisable in chronic sinusitis cases. This practice removes excess ‘\textit{kapha}’ from the digestive tract starting from mouth to stomach. Reduction in ‘\textit{kapha}’ from the body naturally helps to reduce the sinusitis. Similarly, \textit{dhauti kriya} stimulates the digestive power which in turn helps to relieve the aggravated ‘\textit{kapha}’ from the body. Other \textit{kriyas} like \textit{kapālabhāti},\textsuperscript{34} \textit{Vahnisāra}\textsuperscript{39} and \textit{nauli}\textsuperscript{40} also increase the \textit{pitta} by increasing digestive capacity.

Practice of \textit{āsanas} helps to reduce the \textit{kapha} by normalizing the \textit{pitta} in the body. \textit{Āsanas} like \textit{paścimottānāsana}, \textit{matsyendrāsana}, \textit{trikonāsana}, \textit{pārśvakonāsana} and \textit{vīparītakarani mūdrā} are highly beneficial to increase the \textit{pitta dosa} by kindering the digestion. \textit{Pranāyāma} helps to regulate the ‘\textit{kapha}’ and ‘\textit{pitta}’ in the body by regulating the breathing.\textsuperscript{27} Classical yogic texts suggest \textit{bhastrikā pranāyāma} to overcome problems due to imbalance of
‘tridosa’. Sūryabhedana pranāyāma activates the pingalā nādi which increases the digestive capacity. Meditation is useful to maintain harmony between kapha and pitta dosa. Similarly, meditation helps to normalise the vāta dosa in the body. Relaxation techniques are necessary to rejuvenate the respiratory and digestive functions after the sinuses are cleansed and activated. Healthy life style has to be maintained along with proper yogic practices. Exposure to the infective causes has to be avoided to maintain healthy sinuses. Since mental stress may upset the pitta and in turn imbalance the kapha in the body, mental health has to be taken care of by healthy life style and yogic practices. Food items like pepper, ginger and honey can be used to stimulate the pitta and digestion. A nutritious easily digestible wholesome food is necessary to maintain healthy sinuses. Heavy, oily, refrigerated food, food which increases the phlegm and fat in the body has to be avoided. Sleep is also one of the important factors that will imbalance the tridosa. Therefore a healthy sleeping habit should be maintained to keep the balanced kapha and pitta.

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