



ANTI-SNORING DEVICE: A REVIEW**NARKHEDE MB, CHINCHOLE PP, MEHETRE GD AND RATNAPARKHI NG***

Dr. Rajendra Gode College of Pharmacy, Malkapur – 443101 Dist. Buldhana (MS), India

*Corresponding Author: Nikhil G Ratnaparkhi: nikgratnaparkhi@gmail.comReceived 18th March 2021; Revised 20th April 2021; Accepted 19th May 2021; Available online 1st June 2022<https://doi.org/10.31032/IJBPAS/2022/11.6.5835>**ABSTRACT**

Snoring is often caused by variety of things, like the anatomy of your mouth and sinuses, alcohol consumption, allergies, a cold, and your weight. If a snorer is having un-refreshing sleep, feeling of choking, recurrent awakening from sleep, daytime fatigue, and change in personality, he/she has crossed the line of demarcation between snoring and potentially life-threatening disease. Anti-snoring Devices are the devices which use to stop snoring and clear the pathway for air. Anti-snoring Devices may useful to treat Obstructive sleep apnea. This review article focuses on anti-Snoring Device used worldwide with their significance.

Keywords: Snoring, Anti-snoring Devices, Obstructive sleep apnea**INTRODUCTION**

Obstructive sleep apnea or Snoring occurs when vibrations of the pharyngeal airway create a respiratory sound during sleep. Snoring is a common sleep disorder of breathing, commonly encountered in middle-aged individuals. If a snorer is having un-refreshing sleep, feeling of choking, recurrent awakening from sleep, daytime fatigue, and change in personality, he/she has crossed the line of demarcation between snoring and potentially life-threatening disease. There are many

predisposing factors such as obesity, sedentary life style, heredity, alcohol, and certain drugs that lead to this condition. OSA is affecting the population worldwide. Various studies have been done till date to evaluate its actual prevalence [1]. The Wisconsin Sleep Cohort Study showed that 25% of middle-age men and 10% of middle-age women had sleep-disordered breathing (AHI > 5/h), with 4% of men and 2% of women also having hypersomnolence, fulfilling the current

diagnostic criteria for OSA [2]. OSA-related co-morbid diseases are hypertension [2], coronary artery disease, congestive heart failure, pre-diabetes [3] type 2 diabetes mellitus [3] chronic kidney disease. Usually, OSA sufferers have disturbed sleep affecting their normal life as evidenced by two to three times' higher rates of traffic accidents among individuals with OSA as compared to general population [1]. Therefore, early diagnosis and optimum management of snoring/OSA is of paramount importance. In a hospital-based study of urban men between 35 and 65 years from western India, the prevalence of OSA was 19.5% and is threefold higher in men as compared to women [1, 4].

Snoring

- Snoring occurs when a-collapse, blockage, or restriction, to-the-upper-airway, obstructs air movement (through the-back of the-mouth, throat, or nose), during breathing, while sleeping. The-sound (snoring) is created by the-vibration of the-affected-soft-tissues. In-some-cases, the-sound may-be soft, but in most-cases, it can-be loud and unpleasant, for their bed-partners.
- The-Webster-Dictionary, provided shorter-definition, of snoring, as: 'The action or sound of breathing during sleep with harsh, snorting

noises caused by vibration of the soft palate [5].

- According to MedTerms™ Medical-Dictionary, snoring is: A rough rattling noise made on inspiration during sleep by vibration of the soft palate (the back of the roof of the mouth) and the uvula (the prominent structure dangling down at the back of the mouth). On inspiration, air on its way to the lungs travels by the tongue, the soft palate, the uvula, and the tonsils. When a person is awake, the muscles in the back of the throat tighten to hold these structures in place and prevent them from collapsing and vibrating in the airway. During sleep, the soft palate and uvula may vibrate causing the sounds of snoring [5].
- In the-Cambridge-English-Dictionary, is provided; a-verb 'snore' [snɔr, snɔr], however, is defined as: 'to make loud noises as you breathe while you are sleeping [5].

The following conditions can affect the airway and cause snoring:

- **Your mouth anatomy.** Having a low, thick soft palate can narrow your airway. People who are overweight may have extra tissues in the back of their throats that may narrow their airways. Likewise,

if the triangular piece of tissue hanging from the soft palate (uvula) is elongated, airflow can be obstructed and vibration increased.

- **Alcohol consumption.** Snoring can also be brought on by consuming too much alcohol before bedtime. Alcohol relaxes throat muscles and decreases your natural defenses against airway obstruction [6].
- **Nasal problems.** Chronic nasal congestion or a crooked partition between your nostrils (deviated nasal septum) may contribute to your snoring.
- **Sleep deprivation.** Not getting enough sleep can lead to further throat relaxation.
- **Sleep position.** Snoring is typically most frequent and loudest when sleeping on the back as gravity's effect on the throat narrows the airway.

Types of Snoring (On the basis of anatomy)

Nose-based Snoring

Blocked nostrils as a result of a deviated septum or some physical obstruction in your nose may lead to blocking your airway, thus resulting in nasal snoring.

Other causes include pet and dust allergies, nose stiffness, cold or if you are using certain types of medication.

This kind of snoring can be treated in several ways depending on what causes it:

- Deviated septum's may require you to undergo a surgery
- If snoring is caused as a result of dust allergy, keeping your home neat and tidy will cure it
- Similarly, quitting smoking, or using nasal dilator strips, or a nasal rinse is effective against snoring caused due to cold or stiffness.

Mouth-based Snoring

When a person breathes through the mouth instead of the nose while sleeping, it results in mouth snoring. Blocked nasal passages, enlarged tonsils, or a weak palatal tissue may be the causes behind this type of snoring. If you can't breathe via your nose at night due to a blockage, it causes you to breathe through the mouth, resulting in a vibration of the tissues, hence the snoring sound.

Essentially, a nasal snorer has a slight chance of becoming a mouth snorer if their nasal passages get severely blocked. While breathing happens via the mouth, this can lead to infections as their nose is not filtering the air that's passing through.

In order to avoid this type of snoring, one can use devices such as an adhesive tape especially designed for this purpose, or mouth guards that can help you keep your mouth closed.

Tongue-based Snoring

This type of snoring occurs because the tongue gets too relaxed, particularly when

we lie down on our back, thus blocking the airflow into the lungs. As a result, it becomes difficult to breathe, thereby causing snoring.

Tongue-based snoring may occur in people who love to drink alcohol or use sleep medication. Excessive fat around the neck may also be a cause of tongue based snoring.

Anti-snoring pillows and backpacks are useful ways of preventing this kind of snoring. They keep you on your side, preventing you from turning on your back, thus avoiding difficulty in breathing.

Snoring mouthpieces or mandibular advancement devices are especially designed to be used as a remedy for tongue snorers. It helps move your jaws forward, thus preventing the tongue from blocking the back of your throat, and ensure uninterrupted breathing.

Throat-based Snoring

This kind of snoring is the loudest, and most dangerous of all. It is caused as a result of sleep apnea, a condition where the person stops breathing several times during the night in his sleep. And this condition occurs when the muscles and soft tissues in the throat area are too relaxed. They lead to a blockage in the walls of the throat, not allowing the air to pass through, thus resulting in tongue-based snoring or sleep apnea.

It occurs in every sleeping position, and can lead to diabetes, high blood pressure and stroke if left untreated. Sleep apnea needs medical attention right away, and the most common methods of treatment are CPAP therapy, UPAP therapy and UAS therapy.

Treatments & Remedies

Lose weight if you are overweight. This will help reduce the amount of tissue in the throat that might be causing your snoring. You can lose weight by reducing your overall caloric intake by eating smaller portions and more healthy foods. Make sure you get regular exercise daily. You may also consider seeing your doctor or a nutritionist for help. Body mass index target needs to be set at 25 kg/m^2 , in weight reduction programmers, to achieve clinically relevant response in a snorer. There is no need to put extra emphasis, on further reduction of BMI [7].

Sleep on your side.

Sleeping on your back sometimes causes the tongue to move to the back of the throat, which partly blocks airflow through your throat. Sleeping on your side may be all you need to do to allow air to flow easily and reduce or stop your snoring.

Rise up the head of your bed.

Elevating the head of your bed by four inches may help reduce your snoring by keeping your airways open.

Correct structural problems in your nose.

Some people are born with or experience an injury that gives them a deviated septum. This is the misalignment of the wall that separates both sides of the nose, which restricts airflow. It may cause mouth breathing during sleep, causing snoring. It may be necessary to get surgery to correct this condition. Talk to your doctor.

Limit or avoid alcohol before bed.

Try not to consume alcohol for at least two hours leading up to your bedtime. Alcohol can relax the throat muscles, causing snoring.

Avoid taking sedatives before bed.

If you snore and take sedatives, talk to your doctor to see what your options are. Stopping sedative use before bed may ease your snoring.

Stop smoking.

Smoking is an unhealthy habit that can worsen your snoring. Talk to your doctor about therapies such as gum or patches that can help you quit. OSA may be responsible for for the nicotine addiction. Thus, on one hand, giving up smoking is advisable when doctors consider therapy for OSA [8].

Get enough sleep.

Make sure you get the recommended seven to eight hours of sleep you need each night.

Get UPPP (uvulopalatopharyngoplasty).

This type of surgery tightens throat tissue in the hopes it will reduce snoring. Laser-

assisted uvulopalatopharyngoplasty (LAUPPP), which is sometimes more effective than UPPP, is also available [8].

Radio frequency tissue ablation (somnoplasty)

This new treatment uses low-intensity radio waves to shrink the tissue on your soft palate to reduce snoring [8].

Anti-snoring Devices.

Anti-snoring Devices are the devices which use to stop snoring and clear the pathway for air. There are many types of anti-snoring devices, there are follows:

Anti Snore Chin Strap: A snoring chin strap works by supporting your chin during sleep, which in turn, keeps your mouth closed. This prevents air from traveling to and from your throat, therefore minimizing the rapid flapping that is the primary cause of the sound that snorers make [9].



Figure 1: Anti Snore Chin Strap [9]
Anti Snoring & Air Purifier: Snoring can cause endless issues; this device is specially designed to treat sleep apnea, snore and nasal congestion. It is used to purify air pollution, allow you to breathe fresh and healthy air.



Figure 2: Anti Snoring & Air Purifier [9]

Breathe Right Nasal Strips: Breathe right nasal strips have unique engineering that make them an effective tool for managing nighttime congestion and improving sleep. The nasal strips provide instant relief for congestion due to colds, allergies, or a deviated septum and reduce snoring caused by nighttime nasal congestion.

The results showed a significant increase in all subjects of transnasal airflow and in the average cross-sectional area of the nasal cavity that quantifies objectively the subjective impression of improved nasal breathing. In such patients where an improvement in nasal ventilation is desired, the use of the Breathe Right nasal strips seems to offer a beneficial treatment [10].

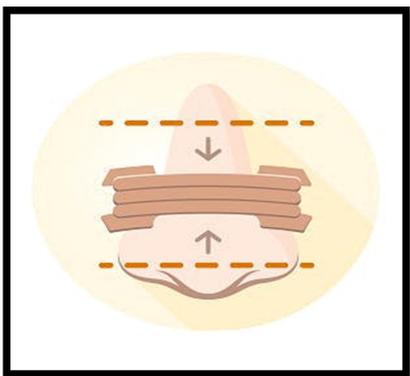


Figure 3: Breathe Right Nasal Strips [10]

Magnetic Anti-snore Nose Clip:

Using gentle pressure and magnetic. Therapy the acusnore nose clip helps open nasal passages taking pressure off parts of the throat that vibrate and cause snoring. An improvement over snore strips the acusnore nose clip requires no painful peeling off and has built-in therapeutic magnets

A nasal dilator, wherein the nasal dilator is a set comprising two bodies, each of the two bodies having

- a first leg having at a distal portion thereof a first magnet having a magnetic field of a first magnetic field strength; and
- a second leg connected to the first leg via a bridge comprising flexible material, the second leg having at a distal portion thereof a magnet-attractable element formed of metal, the metal magnet-attractable element having a second magnetic field of a second magnetic field strength, the second magnetic field strength being weaker than the first magnetic field strength, with the first and second magnetic fields resulting in a combined magnetic field, each of said two bodies capable of being clamped to an ala nasi of a human nose between the distal portions of said first leg and said second leg, so that when the two bodies

are used as a set on the human nose the combined magnetic field of the body on the right ala nasi opposes and repels the combined magnetic field of the body on the left alae nasi thereby pushing the alae nasi apart, resulting in widening of the nasal passages [11].



Figure 4: Magnetic Anti-snore Nose Clip [11]

Anti snoring Mouth guard: Using mouthpieces designed to reduce snoring episodes. These devices, also called mouth guards, fall into two general categories. Tongue retaining devices (trds) grip the tongue and prevent it from falling into the back of the throat, which commonly causes snoring for back sleepers [12]. Use of a novel intraoral device to reposition the tongue and open the airway during sleep resulted in significant improvements in snoring. Subjects reported significant improvements of at least 50% on all primary endpoints in this study. No significant differences were noted in response to treatment based on age, BMI, or gender. More than 90% of habitual snorers self-reported improvement with use of the

device. Users who had previously reported trying other intraoral devices without success performed just as well in this trial as those who had not attempted another intervention, suggesting the investigational device may have benefits for patients beyond those of traditional treatments [13].



Figure 5: Anti snoring Mouthguard [13]

Anti-snoring Pillow: Electronically operated anti-snoring pillow that analyzes breathing noise and shifts the slippers head position until snoring stops, which can be used to reduce or enlarged the air chamber of pillow to change the head position of slipper. The Pillow has air chamber which is operated by universal motor the system can be used to change the pressure of air chamber in order to change the head position of the slipper to obtain optimum breathing position at which snoring will be stopped completely. Snoring is mainly due to the obstruction of air flow caused by the blockage in mouth of human being and will create vibration on respiratory structure and sounds. Embedded System circuit can be used to stop snoring [14].

An anti-snoring pillow having a top pillow, a bottom pillow, and a covering is provided. The bottom pillow has a top surface angled with respect to a bottom surface. The top surface of the bottom pillow has a head-receiving cavity defined therein. The covering has a top section, a middle section, and a bottom section. The top pillow is in the top section and the bottom pillow is in the bottom section. The middle section maintains the top pillow centered over the head-receiving cavity during use.

In another embodiment, the anti-snoring pillow has a top pillow, a bottom pillow, and a covering. The top pillow has a first density and the bottom pillow has a second higher density. The bottom pillow has a top surface configured to receive the top pillow and to position a head of a user in a predetermined position when in use. The covering has a top section, a middle section, and a bottom section. The top pillow is in the top section, while the bottom pillow is in the bottom section. The middle section maintains the top pillow in a selected position with respect to the bottom pillow during use [15].



Figure 6: Anti-snoring Pillow [15]

Bioelectric Anti-snoring device:

These devices, which loosely resemble an athlete's mouth guard, help open your airway by bringing your lower jaw (mandible) and/or your tongue forwards during sleep. This movement (known as 'protrusion') increases the space behind your tongue.

The snore detection module may be configured to detect snore, such as by detecting vibrations caused by snoring. When snoring is detected, the control module may be configured to instruct the actuation module to apply stimulation to the user that is calibrated to cause the user to shift sleeping position without disturbing sleep. The movement detection module may be configured to monitor user movement. If the user fails to move in response to the actuation, the actuation module may increase the intensity of the actuation. If the user responds to the actuation, the process may be repeated after a predetermined delay to provide continuous snore monitoring and correction throughout user sleep [16].



Figure 7: Bioelectric Anti-snoring device [16]

Positive Air pressure: Contemporary epap devices have two small valves that allow air to be drawn in through each nostril, but not exhaled; the valves are held in place by adhesive tabs on the outside of the nose. The mechanism by which epap may work is not clear; it may be that the resistance to nasal exhalation leads to which in turn increases respiratory drive or that resistance to exhalation generates pressure that forces the upper airway to open wider.

An oral and nasal system that reduces snoring and obstructive sleep apnea (OSA) by allowing air inhalation in conjunction with restricted air exhalation [17].

Nasal Air Cannula: A nasal cannula of the type adapted to be interconnected to a gas or oxygen supply [18]. A snore-reducing nasal air cannula comprising, an outlet said outlet having a jacket pipe, wherein said jacket pipe has an end near a patients' nose and said end is configured so that during operation it seals substantially tightly the patient's nose, and wherein a nozzle is configured in the jacket pipe, said nozzle allowing blowing air toward said end of the jacket pipe near the patient's nose and, wherein said jacket pipe further comprises an inside wall having a narrowing between said nozzle and said end near the person's nose and then flaring out from said narrowing toward said end near the person's nose and thereby forming a diffuser [19].

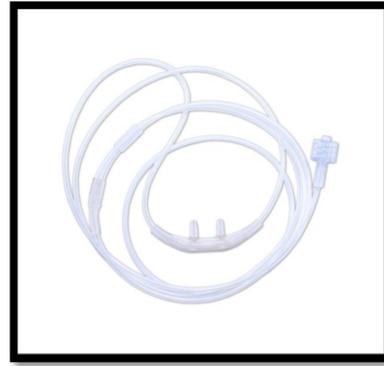


Figure 9: Nasal Air Cannula [19]

Skin Compatible Adhesive: Anti-snoring devices, more specifically to externally worn anti-snoring devices covering essentially a wearer's mouth and being adhesively attached to a wearers skin in the peri-oral area are described. The articles utilise an improved adhesive so as to facilitate easy application and removal of the article from the wearer, whilst ensuring maintenance of the article in the desired position. In particular the adhesives provide attachment on greasy and oily skin [20].

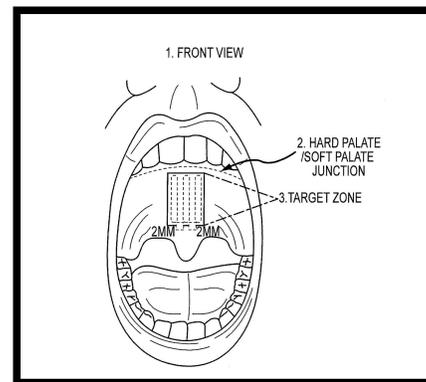


Figure 10: Skin Compatible Adhesive [20]

CONCLUSION

Physicians and other healthcare professionals should be aware medical devices used for management of diseases/disorder. Anti-snoring Devices are the devices which use to stop snoring and clear

the pathway for air. Anti-snoring Devices may useful to treat Obstructive sleep apnea.

REFERENCES

- [1] Sharma SK, Ahluwalia G. Epidemiology of adult obstructive sleep apnoea syndrome in India. *Indian J Med Res.* 2010; 131: 171–5. [PubMed: 20308742]
- [2] Lattimore JD, Celermajer DS, Wilcox I. Obstructive sleep apnea and cardiovascular disease. *J Am Coll Cardiol.* 2003; 41: 1429–37. [PubMed:12742277]
- [3] Fredheim JM, Rollheim J, Omland T, Hofso D, Roislien J, Vegsgaard K, *et al.* Type 2 diabetes and prediabetes are associated with obstructive sleep apnea in extremely obese subjects: A cross-sectional study. *Cardiovasc Diabetol.* 2011; 10: 84. [PMCID: PMC3206416] [PubMed: 21943153]
- [4] Lurie A. Obstructive sleep apnea in adults: Epidemiology, clinical presentation, and treatment options. *Adv Cardiol.* 2011; 46: 1–42. [PubMed: 22005188]
- [5] Starovoytova, D., School of Engineering, Moi University PO Box 3900, Eldoret, Kenya.
- [6] Issa, F.G. and Sullivan, C.E., 1982. Alcohol, snoring and sleep apnea. *Journal of Neurology, Neurosurgery & Psychiatry*, 45(4), pp. 353-359.
- [7] Shukla, A.D., Jain, S., Mishra, R. and Singh, A.K., 2013. Does ‘weight reduction’ help all adult snorers?. *Lung India: Official Organ of Indian Chest Society*, 30(1), p.16.
- [8] Trenchea, M., Deleanu, O., Suța, M. and Cristina, O., 2013. Smoking, snoring and obstructive sleep apnea.
- [9] Vorona, R.D. and Ware, J.C., 2014. Use of a chinstrap in treating sleep disordered breathing and snoring. *Journal of Clinical Sleep Medicine*, 10(12), pp. 1361-1361.
- [10] Gosepath, J., Mann, W. J. and Amedee, R.G., 1997. Effects of the Breathe Right nasal strips on nasal ventilation. *American Journal of Rhinology*, 11(5), pp. 399-402.
- [11] Andre, R., 2017. Nasal dilator and use thereof. U.S. Patent 9, 775, 738.
- [12] Chiu, S., 2010. Anti-snore mouthguard. U.S. Patent Application 29/363, 005.
- [13] Cozean J, Greenburg J, Cozean C(2019) Novel Anti-Snoring Mouthpiece to Reduce Snoring in At-Home Study. *J Sleep Disord Manag* 5: 022. Doi.org/10.23937/2572-4053.1510022

-
- [14] Suryawanshi, R. and Zende, A., 2010, March. Electronically Operated Anti-snoring Pillow. In 2010 Second International Conference on Computer Engineering and Applications (Vol. 1, pp. 626-628). IEEE.
- [15] Frisbee, C.K., First Impressions Home Marketing Inc, 2006. Anti-snoring pillow. U.S. Patent 7, 100, 227.
- [16] Xu, J., Wang, H., Cao, H., Xu, D.P. and Shen, C., 2016. Sleep control device. U.S. Patent Application 14/796, 996.
- [17] Robson, J.D., Robson Jack D, 2011. Anti-snoring device using naturally generated positive pressure. U.S. Patent Application 12/723, 668.
- [18] Mizerak, V.S., Mizerak Vladimir S, 1981. Nasal cannula mask. U.S. Patent 4, 263, 908.
- [19] Genger, H., Baecke, M. and Schneider, H., Seleon GmbH, 2006. Anti-snoring device, method for reducing snoring, and a nasal air cannula. U.S. Patent 7, 080, 645.
- [20] Barakat, M.A. and Palumbo, G., Barakat Mohamed Ali, 2006. Anti-snoring device comprising a skin compatible adhesive. U.S. Patent 7, 055, 526.
-