The Danger of Obstructive Sleep Apnea (OSA)

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Introduction

Sleeping is an essential process where the body initiates recovery and repair following a long and exhausting day. But, sleeping can pose a serious threat to individuals with sleep apnea. Obstructive sleep apnea, also known as OSA, is the most common sleeping apnea with nearly 1 billion people around the world suffering from this condition. This research report aims to educate and spread the importance of early treatments regarding obstructive sleep apnea.

Patients with OSA often experience tiredness and lack of focus during the day, along with the possibility of developing mental illnesses like depression and anxiety. This is due to the relaxation of the patient's airway muscles during sleep, which narrows the airway and eventually blocks their breathing. While the airway collapses, the body is unable to conduct the exchange of oxygen and carbon dioxide through breathing, which results in the blood oxygen reducing and carbon dioxide accumulating inside the bloodstream in a process called hypercapnia. When there is an excessive amount of CO2 present in the body, individuals experience symptoms like dizziness, headaches, and dyspnea. Furthermore, the low amount of oxygen results in reduced blood flow to the brain, also known as cerebral hypoxia. It affects the patient's ability to carry out intellectual functions and increases the chances of severe conditions that are irreversible such as prolonged vegetative state and brain death.

According to NIH, a study done in 2008 using TMT to assess the patient's intellect concluded that 59.2% of obese OSA patients have at least one intellectual impairment. In another study conducted in 2022, the scientists noticed a decrease in brain metabolism and neuronal loss, indicating the effect of OSA on patients' brains. Though they are not sure of the exact cause for

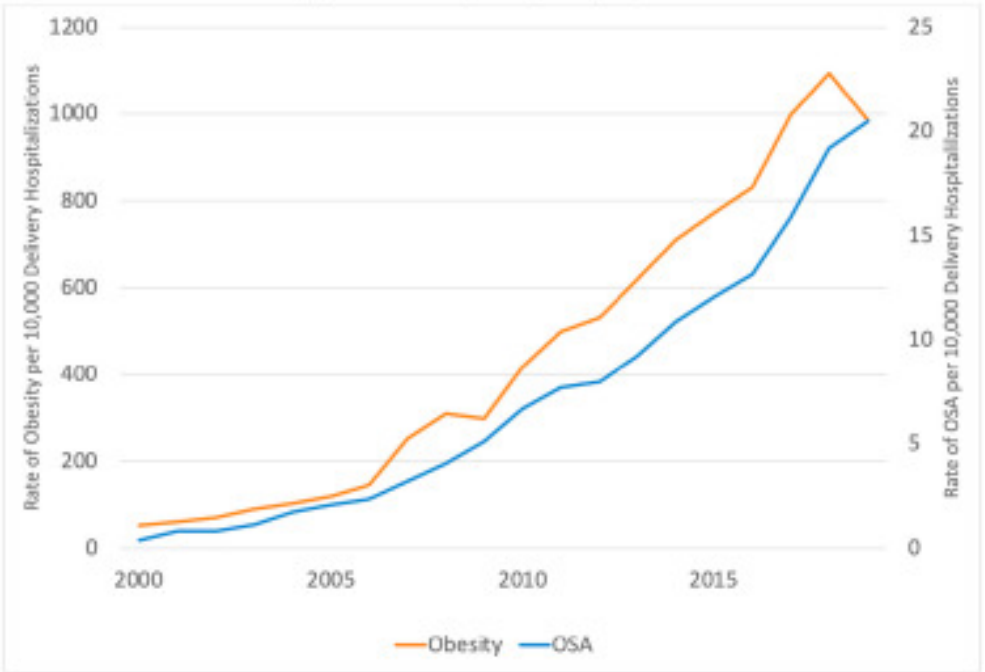
this, they suspect that it has a direct correlation with cerebral hypoxia also caused by OSA when lack of oxygen damages the brain's functions.

Obstructive sleep apnea is commonly found in individuals with a family history of a close relative suffering from this illness though there is no direct evidence proving OSA is passed down by heredity currently. However, many factors can influence the chance of developing OSA, including obesity, changes in hormone levels, or even the anatomy of the head and cervical structures. Maintaining a healthy lifestyle is crucial in preventing the development of OSA, and obese patients are recommended to lose weight as it reduces risks of not only OSA, but also other medical conditions like hypertension, diabetes, and dyslipidemia.

Current trends

According to a study done by ATS Journal, OSA has sought an increase from 0.14% to 4.59% in Alberta, Canada from 2003 to 2020. Obesity, being the leading cause of the increased OSA trend, has nearly tripled from 1975 to 2016, which matches the period of increased number of OSA patients. The graph below shows the direct correlations between the numbers of OSA and obesity patients from 2000 to 2019.

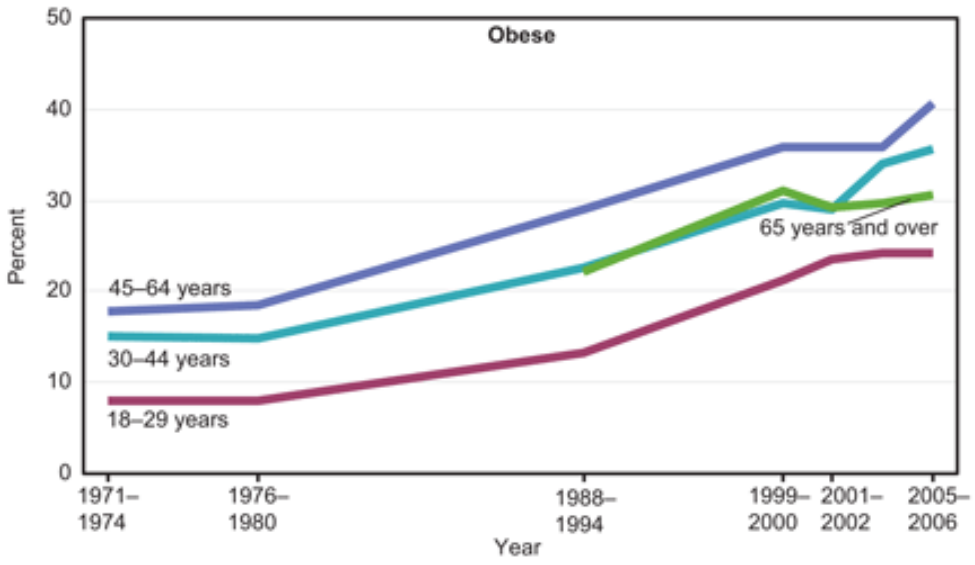
Figure: Trends in obstructive sleep apnea and obesity during delivery hospitalizations from 2000 to 2019



Legend: The figure demonstrates trends in obesity (left axis) and obstructive sleep apnea (right axis). OSA, obstructive sleep apnea

China has the highest prevalence rate with nearly 176 million patients suffering from OSA, followed by India with 36 million patients. A theory hypothesizes that Asians are more prone to be affected by OSA due to their cranial structure. AASM conducted a study comparing the prevalence of OSA in Caucasians and Asians with similar BMI and age. By comparing the two groups, it is evident that Asians have a higher rate of obtaining a severe OSA. Even though Caucasians generally have a higher BMI and rate of obesity globally, they are less likely to experience OSA compared to Asians. According to this study, Asians have smaller and more restrictive facial features, which appear to be a factor that increases the risk for OSA, though the correlation has not been proven yet.

Additionally, OSA prevalence tends to increase as the individual's age increases. This is due to the weakening of the structure; worsening the collapsibility of the airway. Factors that contribute to the higher prevalence rate include: Menopause, comorbidities, and systemic inflammation usually caused by the weakening of the immune system. Middle-aged individuals are also a part of the target group for OSA as that tends to be the age sector where obesity is most commonly found. Below is a chart comparing the obesity rate among different ages.



Other than age, another factor that seems to influence the risk of getting OSA is gender. According to the NIH, men have a higher chance of obtaining OSA than women. Though the exact reason for this is still unknown, they believe that different airway structures, lifestyles, and hormones produced all play a role in making males more prone to developing OSA. However, males and females have equal chances of developing OSA once they reach middle age. It is noted that menopause can often lead to many disorders due to the loss of reproductive hormone changes. The loss of estrogen and progesterone hormones can often lead to the weakening of the airway muscles, making women susceptible to OSA.

Etiology

Obstructive Sleep Apnea is a noncommunicable disease, they do not experience the chain of infection that contagious diseases go through. However, because the disease does not spread from person to person, this means that OSA is caused by either genetics, unhealthy lifestyle, or degrading health. Though the inheritance pattern has not yet been figured out, scientists

estimated that an individual with a first-degree relative experiencing this illness is 50% more likely to develop OSA compared to others who do not have a defective gene.

As previously mentioned, obesity is one of the biggest risk factors for the development of OSA. Obesity can result in excessive fatty deposits in the airway, which increases the pressure on the respiratory tract and results in the collapse and inability of muscles to control themselves. Obesity can also contribute to large neck and body circumferences, which further increase the chance of developing OSA as the airway becomes more restrictive. Moreover, obesity can lead to conditions far more dangerous than OSA. The plaque buildup in the airways restricts the lung's ability to expand, which compromises the patient's ability to breathe and perform the body's vital functions. The inability to exchange oxygen and carbon dioxide causes hypoxemia, where there is a low amount of blood oxygen and an excess amount of carbon dioxide in the bloodstream. Hypoxemia can cause irreversible and possibly fatal damage to the body as organs are unable to receive the oxygen required to function, leading to apoptosis of the somatic cells. According to the NIH, brain cells start undergoing apoptosis in less than three minutes without the presence of oxygen. And because brain cells are unable to replace one another through mitosis, damage to brain cells is permanent and irreversible.

Eating a healthy diet can reduce the patient's symptoms and other complications associated with the disease. OSA patients are recommended to avoid alcohol, dairy products, red meat, and food containing lots of sugar or trans and saturated fats. These types of foods can often intensify the condition even more. The patients should eat a diversified diet including vegetables, fruits, whole grains, and low-fat dairy products. Eating a diversified and healthy diet can strengthen the immune system, as well as lowering body fat, and help lose weight.

Lifestyle has a tremendous impact on any of the illnesses. Maintaining a healthy lifestyle is associated with longer life expectancy, reduction in the burdens of chronic illnesses, and prevention of disease with the strengthening of the immune system. Generally, patients are recommended to exercise for at least 30 minutes every day according to the Mayo Clinic. As OSA is often caused by obesity, exercising can help reduce body fat and improve the condition of OSA.

Diagnosis and treatment

The most widespread diagnosis for obstructive sleep apnea is polysomnography. By monitoring the patient's heart, lung, and brain activity, the test is able to identify the patient's sleeping cycles. Polysomnography is also able to determine the factors disrupting a patient's sleep by spotting the abnormalities in the patient's blood oxygen, respiration rate, and heart rate. The positive side to this diagnosis is that it poses no threat to the human body, with its only side effect being possible irritation of the skin caused by the adhesive tape. Advise a medical professional for more details on polysomnography and if it is the best diagnosis for you. Generally, do not consume food containing caffeine or alcohol as they can lead to an inaccurate result, and do not apply any makeup or substance onto the skin as it can prevent the sensor of the diagnosis from functioning properly.

Some of the signs and symptoms observed in OSA patients include high blood pressure, daytime sleepiness, lack of focus, mood swings, and more. The most efficient treatment currently for treating OSA is the continuous positive airway pressure or CPAP. This device delivers air pressure through a mask, which keeps the airway open when patients are asleep. Even though the machine is very efficient in aiding patient's sleep, there are several downsides to it. First, the

machine is very costly, ranging from around $600-$1000 USD. Second, a prescription is required from the doctors for the patients to be able to buy and use it for their use. As an alternative, there are surgical procedures that can treat OSA. A common example is the Uvulopalatopharyngoplasty (UPPP). UPPP is a surgery involving the removal of excess tissues in the airway, which frees up space and allows the patients to breathe in their sleep without disruptions. This surgery has a success rate of about 51%, and generally, it cannot completely remove the symptoms of OSA, but it will improve the condition. UPPP is recommended for those with structural defects. Patients who develop OSA due to obesity are usually not recommended for this procedure as excessive fat can build up in the throat again.

As of right now, there is a new proposed treatment that serves as a substitution for a CPAP device, and it is called the Inspire Sleep Apnea Innovation. Developed by Inspire Sleep, the innovation was approved by the FDA in 2014. Inspire opens patient's airways and allows them to breathe freely when they're sleeping without the use of masks. Through incisions, the device is placed underneath the patient's skin, and patients are able to control the device with the use of a controller. This has shown a significant improvement in OSA patients, with a 79% reduction in sleep apnea events. However, because of how expensive it costs, it is not widely used around the world.

Conclusion

Obstructive sleep apnea has been an increasing concern around the globe due to the growing poverty rates and bustling urban lifestyles; causing an increase in the number of obese patients. Unhealthy lifestyles can lead to the development of many complications, including obstructive sleep apnea. OSA patients often have an impaired social life along with suffering

from agitation and financial struggles to treat the condition. Maintaining a healthy lifestyle and diet is crucial to preventing OSA. Patients are recommended to exercise every day and maintain a healthy BMI as obesity is a major risk factor for the development of the condition. Although there is no way to completely cure OSA, there are treatment plans that can drastically improve the lives of those suffering from it. Obstructive sleep apnea is yet another unfamiliar condition that is actively being investigated by scientists around the globe. With the improvement of modern technology, scientists will be able to learn more about the condition and carry out affordable treatments in no time.

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