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An Extension to STOP BANG Questionnaire for Obstructive Sleep Apnea

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Abstract

Introduction: Obstructive Sleep apnea is a mute killer which however, if diagnosed earlier, could be averted from worsening. Although many questionnaires have been put forth for screening the same, a more sensitive questionnaire (AIMS) has been formulated, as an extension to STOP BANG questionnaire (by far the best tool) which can be extrapolated to the general population efficiently.

Material & Methods: Questionnaire was circulated manually in the general population (n=350) and responses were obtained. Patients with a score of 0-3 are classified as low risk, those having 4-7 were categorized as mild to moderate and 8-12 score were classified as moderate to severe OSA.

Results: 58 % of the study population was categorized as low risk, 32 % as mild to moderate risk and 10% as moderate to severe risk. The results were statistically significant (p<0.001).

Conclusion: STOP BANG AIMS is a better gauging tool to calibrate OSA in initial stages itself, amongst the general population.

Keywords: obstructive sleep apnea, screening questionnaire, sleep related breathing disorders

Introduction

Obstructive sleep apnea (OSA) is characterized by episodes of partial or total obstruction in the upper airways during sleep in combination with snoring and often daytime sleepiness and tiredness.[1]

Obstruction causes an arousal reaction with consequent sleep disturbance and impairment of sleep quality. [1]

Sleep-related breathing disorders (SRBDs) are characterized by disordered respiration during sleep, which are delineated as pauses in breathing or instances of abnormally low breathing during sleep. They are grouped as primary snoring, upper airway resistance syndrome, and OSA, along with the related entities of central sleep apnea and sleep-related hypoventilation.[2]

OSA is the most common category of SRBD's and said to be a silent killer, hence it's very important to diagnose the condition. Many tools are available for the same. For e.g., Polysomnography [3], Epworth scale [4], Modified Mallampati Classification [5], Brodsky scale [6], Apnea-Hypopnea Index (AHI), Respiratory Disturbance Index (RDI) [7], etc.

However, a questionnaire can help us in detecting the problem more conveniently on the go. Especially for screening the generalized population for early detection of the condition, So, to increase the scope

of the STOP BANG questionnaire (SBQ) [9], this study is carried out.

The objective of the study is to increase the accuracy and sensitivity of the conventional questionnaire as well as extrapolate the questionnaire on the general population.

Material And Methods

The questionnaire (SBQ [8] [9] along with AIMS) was circulated in the general population and responses were obtained.

Table 1: Explication of STOP abbreviation

S	**Snore** loudly (louder to be heard through closed doors or louder than talking)	Yes	No
T	Often feel **tired** or sleepy during the daytime?	Yes	No
O	Anyone has **observed** you stop breathing or gasping during your sleep?	Yes	No
P	Are you being treated for or do you have high blood **pressure**?	Yes	No

Table 2: Explication of BANG abbreviation

B	**BMI** more than 35	Yes	No
A	**Age** – over 50 years old?	Yes	No
N	**Neck** circumference- is it greater than 17" if you are a male or 16" if you are a female?	Yes	No
G	**Gender**- are you a male?	Yes	No

Table 3: Explication of AIMS abbreviation

A	Frequency of **arousal** from sleep	Yes	No
I	Frequency of Upper airway **infection**	Yes	No
M	**Mood** swings or irritability	Yes	No
S	**Sweating** in night while asleep	Yes	No

Patients with a score of 0-3 are classified as low risk, those having 4-7 were categorized as mild to moderate and 8-12 score were classified as moderate to severe OSA.

Results

58 % of the study population was categorized as low risk, while 32 % recorded as mild to moderate risk and 10% as moderate to severe risk. The results were statistically significant ($p<0.001$). Also, this proves that it can be applied to the general population.

Discussion

OSA is a condition which can sneak in, more often, especially in the stressed times just like that of COVID. Hence, it's necessary to screen the population for the same as prevention is better than cure.

Many questionnaires are available to gauge the OSA. For ex. Berlin questionnaire [10], STOP questionnaire [8], STOP BANG questionnaire [9], Epworth Sleepiness scale [4], BASAN Index [11], NoSAS [12], etc. This study, however, emphasizes the importance for frequency of arousal from sleep, frequency of Upper airway infection, mood swings or irritability and Sweating in night while asleep. These factors reinforce the apt STOP BANG questionnaire and can be condensed into an acronym- AIMS.

STOP BANG questionnaire [9] was given by Frances Chung in 2016 which was an excellent yardstick for screening for OSA. But it was conducted on Sleep clinic patients.

In the review conducted by Amra et al [13], they came to the conclusion that even though SB and SBQ were reliable questionnaires for sleep patients, there were no validation studies for screening general population. However, the present study screens the general population and has tried to cover this research gap.

It's also important to be aware of the basics of Sleep and Sleep pathologies. Normal sleep [2] is a cycle of "Non-rapid eye movement (NREM) sleep" which accounts for 75% of sleep and "Rapid eye movement (REM)sleep" which accounts for 25% of sleep; alternatively at the intervals of 90-120 minutes.

Revised Sleep staging:

1. Stage W (Wakefulness)
2. Stage N1 (NREM1)

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3. Stage N2 (NREM2)
4. Stage N3 (Replaces NREM stage 3 & 4)
5. Stage R (REM)

Minimum amount of sleep required is as follows:

1. In infants- 12-14 hours
2. In pre- adolescents- 10-11 hours
3. In young adolescents- 8-10 hours
4. In adults- 7-9 hours

Normally, ventilatory activity of respiratory muscles get depressed. Eventually there is fall in ventilation and increase in resistance of upper airway. Hypercarbia occurs.

In REM, generalized inhibition of skeletal muscles (intercostals, accessory & pharyngeal dilators) occurs i.e., REM is dependent on diaphragmatic function resulting into increased resistance.

Pathophysiology of sleep disorders:

Two theories are linked to abnormal sleep –

1. Obstacle theory [14]: Increased negative pressure retracts structures of pharynx which creates its vibration resulting into snoring,
2. Bernoulli Theory [2] (1738): It was established by Daniel Bernoulli. Velocity of streaming air is increased and pressure at the lateral wall decreases. There is inward suction of pharyngeal structures in constricted area. Airway collapses if the transmural closing pressure is reached.

SRBD's have become so frequent that knowing the roots of the same is crucial.

1. Sleep apnea can be classified as:
2. Central (due to CNS)
3. Obstructive (due to anatomical & environmental factors)
4. Mixed (combination of central & obstructive: severe)

Obstructive sleep Apnea is defined as "potentially life-threatening condition in which periodic cessation of breathing occurs during sleep in presence of inspiratory efforts".

Obstruction brings about an arousal reaction with resultant sleep disturbance & impairment of sleep status. Event of at least 5 apneas /hypopneas per sleep hour ensuing in sleep fragmentation & diminished oxygen saturation.

Anatomical variations in upper airway:

Reduction in activity of the tensor veli palatini and genioglossus muscles, which resist the change of shape of the airway when there is negative pressure.

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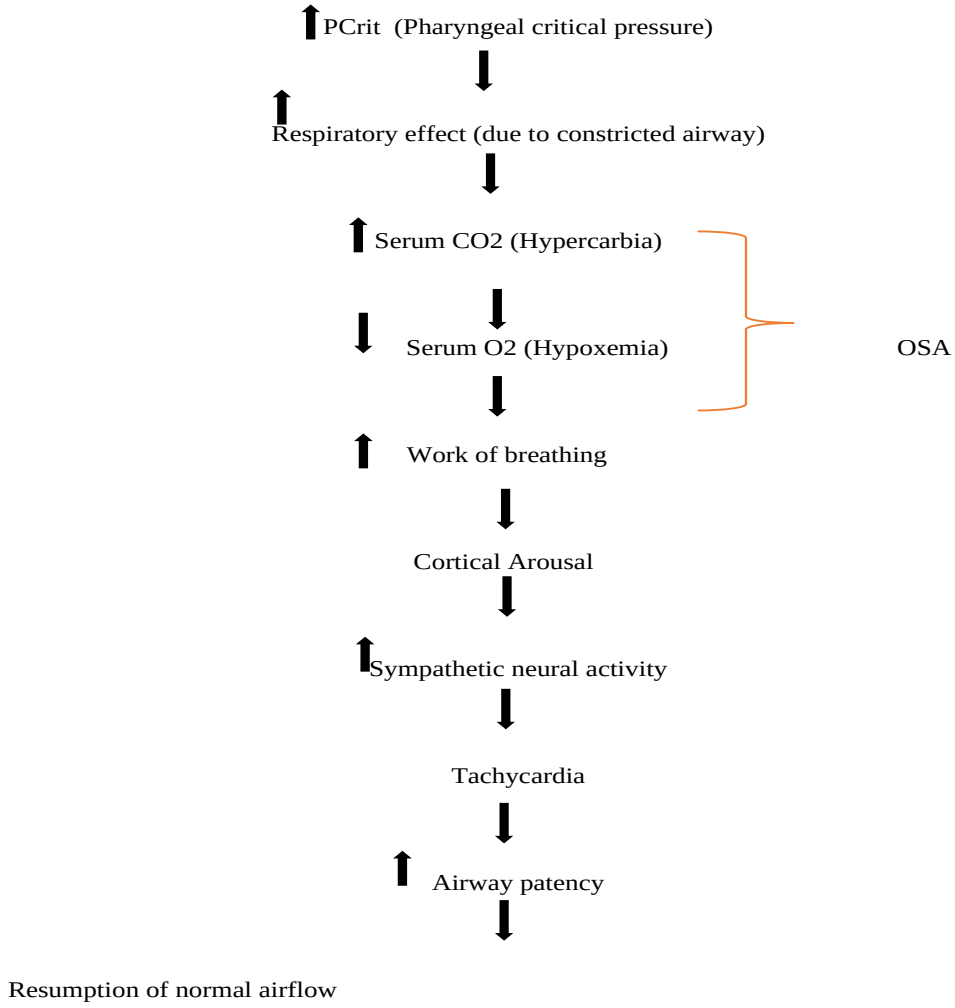
Etiology:

Adult OSA [1] -

Occurs a function of increased collapsibility of upper airway



Pediatric OSA

1. lymphoid hyperplasia
2. growth related changes in upper airway
3. obesity
4. Syndromes associated (Down's, Achondroplasia, Apert, Crouzon, Pierre Robin, Pfeiffer, Treacher Collin, Sickle cell disease)

Prevalence [1]

1. Gender predilection- M>F
2. Obesity
3. Individuals considered for bariatric surgery
4. Post stroke patients
5. Aged population

Risk factors [1]

1. Obesity (BMI ≥30 kg/m^2)
2. Male predilection
3. Retrognathia
4. Dolichocephalic head type
5. Steep mandibular plane
6. Mid-face deficiency
7. Macroglossia
8. Menopause
9. Increasing age
10. Anterior open bite
11. Lower hyoid position
12. Adenoids and tonsillar enlargement

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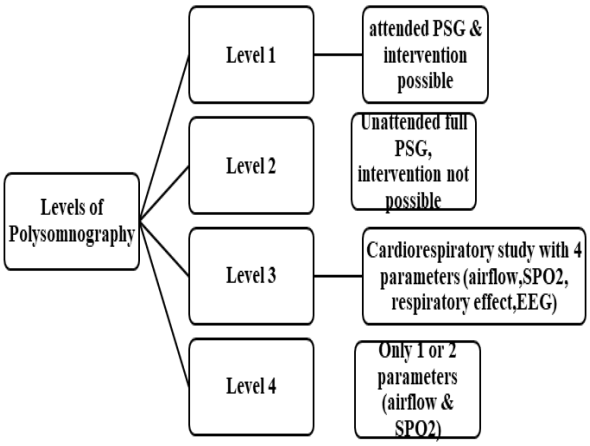
Diagnosis

Polysomnography [3]

It's the gold standard diagnostic tool. It was given by Holland et al 1974. It includes monitoring the patient in sleep for 6 hours by electroencephalography (EEG), electrocardiography (ECG), Electromyography (EMG), Electro-oculography (EOG), airflow through nose & mouth, pulse oximetry, respiratory effort and leg movement.

Table 4: Levels of Polysomnography



Mallampati Classification:

Named after an Indian anesthesiologist, Seshagiri Mallampati, this classification is used to describe patency of oral airway. This was later modified by Huang et al [5] in 2011.

Figure 1: Modified Mallampati Classification

Table 5: Modified Mallampati Classification

Structures	1	2	3	4
Soft palate	Visible	Visible	Visible	x
Hard palate	Visible	Visible	Visible	Visible
Uvula	Visible	Masked by tongue	x	x
Faucial pillars	Visible	Visible	x	x

Brodsky scale [6] (5 grades)

Figure 2: Brodsky's scale

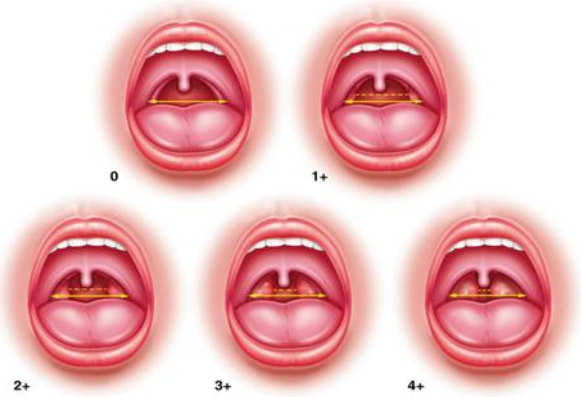


Table 6: Brodsky's scale

Scale	Tonsil size
0	Tonsils entirely within tonsillar pillar
1+	Tonsils occupy < **25%** of oropharynx
2+	Tonsils occupy 25-**50** % of oropharynx
3+	Tonsils occupy 51-**75** % of oropharynx
4+	Tonsils occupy >**75** % of oropharynx

AHI & RDI [7]

The respiratory disturbance index (RDI) includes the number of apneas, hypopneas, and RERAs per hour of sleep.

The apnea-hypopnea index (AHI) includes the number of apneas and hypopneas per hour of sleep.

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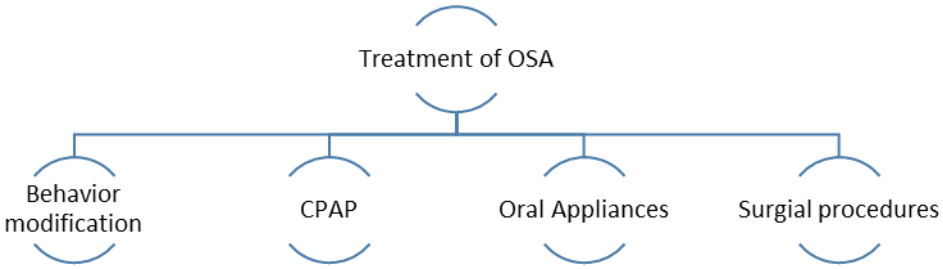
Treatment



CPAP [15]: Positive airway pressure ism the gold standard treatment for OSA. PAP acts a pneumatic splint that maintains patency of the upper airway. It can be delivered through mask interface as either Continuous positive airway pressure (CPAP), Bilevel PAP (BPAP), Auto-titrating PAP (APAP). CPAP was invented by Collin Sullivan in 1980.

MAD's[1]: White et al found mandibular repositioning devices better than CPAP. Mandibular advancement devices can be used along with tongue repositioning devices and FDA approved oral appliances. Orthodontists should always consider screening for OSA if prevalent features are found.

RME can also be used to increase the airway patency of the upper airway with MARPE (Mini-Screw assisted Rapid palatal expansion) and SARPE (Surgically assisted Rapid palatal expansion) as adjunct.

Hence, acquiring all this knowledge, a clinician can efficiently manage the probable OSA patient.

Conclusion

OSA is a condition, an Orthodontists should more often expect to encounter with and should have comprehension to deal with. End points of treatment should include diminished /eliminated snoring, resolution of patients' initial symptoms of OSA, normalization of AHI and oxyhemoglobin saturation. And most important is to diagnose the condition as soon as possible, hence this questionnaire help us screen the general population efficiently.

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