Effectiveness of Oropharyngeal Exercises on Daytimesleepiness, Snoring and Risk of Obstructive Sleep Apnea Amongadults: Review

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Abstract

Introduction: Sleep disorders are very frequent among general population. The prevalence of sleep disturbances varies between 25 and 45%. Types of sleep abnormalities in which snoring is the common among all the adults. Oropharyngeal exercises are new, non-invasive, cost effective treatment modality for individuals having risk of obstructive sleep apnea, daytime sleepiness and snoring.

Methods: The study design was systematic review and it includes studies from databases of PUBMED, MEDLINE, Cochrane library, SCOPUS, Science direct, and Google scholar (2002-2017).

Result: Total 14 relevant articles were under taken. Studies included are related to prevalence, assessment**,** effect of different modalities and oropharyngeal exercises on daytime sleepiness, snoring and risk of obstructive sleep apnea and excludes those studies that involve other sleep disorders like insomnia, narcolepsy and circadian rhythm disorder etc. Abstracted information is related to their design, population characteristics, intervention and outcomes.

Conclusion: Oropharyngeal exercises are effective in reducing the daytime sleepiness, snoring and risk of obstructive sleep apnea among adults having snoring. Several studies came out with the result that oropharyngeal exercises are beneficial in reducing sleep disorders.

Key words: *Oropharyngeal exercises, risk of obstructive sleep apnea, daytime sleepiness, snoring, adults.*

Introduction

Sleep is one of the important factor in individual's life.[1] If sleep disturbance occur daily and creates a problem one may suffer from a sleep disorder. Fifty to seventy million US adults have a sleep disorder.[2]

Snoring is more prevalent in middle aged and older adults ranging from 10% to 20% in women and 29% to 30% in men. It is now suggested to be indicative of a significant clinical problem such as obstructive sleep apnea.[3] Anatomical factors like congenital narrowing of nasal and or pharyngeal cavity, inferior position of hyoid bone, obesity, local deposition of fat in the pharynx and submental region and also supine position etc. More prevalent in males as compare to females.[4] It progress over the course of years and leads to obstructive sleep apnea and it impairs ventilation raising nocturnal hypoxemia.[5]

Daytime sleepiness is one of the common sleep-wake complaints reported by older adults and has been associated with multiple adverse outcomes, including psychiatric disorders, metabolic abnormalities,

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cardiovascular disease and mortality.[6] About 20 percent of adults in the United States report a level of daytime sleepiness.[7]

A frequency of 5 to 15 apneas and hypoapneas per hour of sleep is generally considered as mild sleep apnea, and a frequency >15/h indicates moderate to severe sleep apnea. Obstructive sleep apnea syndrome is a well-known cause of daytime sleepiness that is often associated with snoring. [8]

Snoring is frequently denied, because it is a stigmatizing symptom that is poorly perceived by the beholder. Denial is the most common first reaction after hearing about the problem. [9] Even people hesitate to take treatment for it hence non- invasive treatment is required for treating snoring which is affordable for them. Oropharyngeal exercises reinforce the oropharyngeal muscles and increase their tone, thereby dilating the upper airways during sleep. It is more physiological and may bring long-lasting benefits to the people.[10]

Materials and Method

Research design: Systematic Review

Inclusion criteria: It includes the studies related to prevalence, assessment of snoring, daytime sleepiness and risk of obstructive sleep apnea among adults and also the effect of different modalities and oropharyngeal exercises on these phenomenon.

Exclusion criteria: The study excludes the studies those discussed about the other sleep disorders rather than snoring, daytime sleepiness and risk of obstructive sleep apnea

Data Analysis: Relevant article on the topic of snoring, daytime sleepiness and risk of obstructive sleep apnea and effect of other modalities and oropharyngeal exercises were identified by search of significant articles PubMed/Medline, Science direct, SCOPUS, CINAHL, Elseiver and Google scholar.

Results

A systematic review done and total 130 studies were selected for review, out of which 15 were found to be appropriate. Data was divided into four sections:

Review related to the prevalence of daytime sleepiness, snoring and risk of obstructive sleep apnea.

A cross-sectional study was carried out to determine the prevalence of excessive daytime sleepiness and its associated with sleep habits, sleep problem and school performance in a sample of high school students of both genders between September and December. A total of 11 schools were randomly selected. Overall selected sample consisted of 3871 students (2703 boys and 1168 girls) in the 11th grade. It was measured using the Epworth sleepiness scale. The increased risk of EDS was related to perceived sleep insufficiency ($p<0.001$). [11]

A study was conducted to assess the daytime sleepiness and the association of gender with sleep duration and daytime sleepiness was assessed among sixth to 12th grade students in Mangalore, India. The adolescents were randomly selected using stratified random sampling method. A total of 58 adolescents, 29 males and females each. Data was collected in July and August 2013. Daytime sleepiness was assessed using Cleveland adolescents sleepiness questionnaire. Sleep duration and daytime sleepiness by gender showed no statistically significant differences between male and female adolescents.[12]

A prospective study was conducted to assess the gender difference in symptoms related to sleep apnea in a general population. A second cohort included patients referred for sleep apnea investigation in the same geographic region. A representative sample of 5,424 subjects aged 20 to 69 years living in northern Sweden were taken. Responses were obtained from 4,648 subjects (85.7%). The prevalence of snoring and witnessed apneas increased with age. The referral rate ratio for men/women after correction for population and prevalence of symptoms was 1.25:1 ($p=0.012$).[13]

Review related to the assessment of daytime sleepiness, snoring and risk of obstructive sleep apnea.

A descriptive study was done to assess the evaluation of Berlin Questionnaire Validity for Sleep Apnea Risk in Sleep Clinic Populations. Total 100 patients recruited to Kermanshah University of Medical Sciences. Patients completed a Persian version of BQ and underwent one night of PSG. For each patient, Apnea-Hypopnea Index (AHI) was calculated to assess the diagnosis and severity of OSA. BQ results categorized 65% of the patients as high risk and 35% as low risk for OSA. The sensitivity and the specificity of BQ for OSA diagnosis with AHI>5 were 77.3% and 23.1%, respectively. [14]

A cross sectional study was done to assess the comparison of sleep questionnaire for screening obstructive sleep apnea. They took 234 patients. For sleep questionnaire (Berlin, Epworth sleepiness scale, STOP BANG sleep apnea questionnaire) were administered to the patients. Overnight attended polysomnography was done for all the patients. Out of 234 screened patients 87.1% had OSA, whereas 93.3%, 90.02%, 95.5% and 68.3% were classified as being risk by the Berlin, STOP-BANG questionnaire and ESS respectively.[15]

A population based survey done to determine the excessive daytime sleepiness assessed by the Epworth sleepiness scale and its association with health related quality of life in China. Total 3600 residents was selected randomly. The demographic information, Mandarian version of the ESS and 36-item short form health survey were collected. The average response rate of its 8 items was 97.92%. The ESS scores showed positive skewness in the selected sample with a median (QI, Q3) of 6 (3, 0). 644 (22.16%) respondents reported subjective EDS.[16]

Review related to the different modalities used for daytime sleepiness, snoring and risk of obstructive sleep apnea.

A randomized crossover study was conducted to assess the effect of an oral appliance vs nasal-continuous positive airway pressure in the treatment of mild- moderate obstructive sleep apnea at the University hospital. 27 patients were selected. There was a 2-week wash-in and a 2-week wash-out period, and 2x4-month treatment periods (Oral appliance and nasal CPAP) efficacy, side effects, compliance, and preference were evaluated by a questionnaire and home sleep monitoring. Twelve of the 25 patients who used the OA 48% leads to treatment successes, 6 (24%) were compliance failures and 7 (28%) were treatment failures. [17]

A study was conducted to assess treatment of snoring with the help of tongue- repositioning manoeuvre. A total of 125 consecutive patients from the enrhonchopathy clinic were assessed retrospectively. It took 125 people having problem of snoring. Snoring was observed using a 10-cm visual analogue scale .The score was 8.4 before treatment and decreased to 4.1 after treatment. Analysis of variance showed a significant difference among subjects with a normal body weight (BMI 18.5–25).[18]

A randomized, placebo-controlled, double-blind study done to assess the effectiveness of the training given for tongue muscles improvement by giving Intraoral Electrical Neuro-stimulation among patients suffering from Apnea at University of Witten/ Herdecke, Germany. 67 patients were randomly assigned to 2 groups. Tongue related training was given in morning for 20 minutes and performed twice a day. Snoring is improved but not apnea improved with stimulation. Treatment efficacy was examined by polysomnography. Stimulation training, 47.5 ± 31.2; P< .05 but not with placebo training 62.1 ± 23.8 NS. [19]

Review related to effectiveness of oropharyngeal exercises on daytime sleepiness, snoring and risk of obstructive sleep apnea.

A randomized controlled trial done on 39 patients having diagnosed with snoring and also having the symptoms of mild-to-moderate sleep apnea. Patients are assessed at starting of study and asked about sleep questionnaires (Epworth, Pittsburgh sleep quality index) and check through polysomnography. No significant changes occurred in the control group and randomized to therapy experienced a significant decrease in the Snore Index, p = .017. [10]

A semi-experimental study done on 30 patients with primary snoring, at Amiralmomen university hospital, Iran. They were provided with the sets of exercises for 1month and 30 min a day under the guidance of the speech therapist. It assessed snoring with the help of Visual Analogue Scale and Snoring Scale Score criteria before and after giving the session of exercises, Mean SSS before the study was 7.01 ± 1.72, while it was 3.09 ±2.7 after the study; and the mean VAS scores were 8.54 ± 1.89 and 4.69 ± 2.94 before and after the study, respectively (P = 0.0001).[20]

A randomized study was conducted on patients with moderate obstructive sleep apnea syndrome. They take thirty-one patients with moderate sleep apnea in sleep laboratory, pulmonary division, heart institute, university of sa˜o paulo medical school. They give daily 30 min exercises in experimental group (n=15), no exercises were given. It significantly decrease (P=0.05) neck circumference, snoring frequency, snoring intensity, and the sleepiness in day time obstructive sleep apnea severity. [10]

A systematic review and meta-analysis was done to assess the effect of myofunctional therapy to treat obstructive sleep apnea in adults having snoring, and sleepiness. Data was taken from web of science, scopus,

MEDLINE, and the cochrane library. Nine adult studies (120 patients) reported polysomnography, snoring, and/or sleepiness outcomes. The pre- and post- MT apnea hypopnea indices (AHI) decreased, $P < 0.0001$. Polysomnography snoring decreased from 14.05 ± 4.89% to 3.87 ± 4.12% of total sleep time, $P < 0.001$, and snoring decreased. Epworth Sleepiness Scale decreased from 14.8 ± 3.5 to 8.2 ±4.1. [21]

A randomized control trial was conducted among 20 patients suffering from mild to moderate obstructive sleep apnea syndrome and were given oropharyngeal exercise therapy for 3 months. Epworth daytime sleepiness and Berlin sleep questionnaire, and full polysomnography were performed. There was significant reduction in the neck circumference (38.4±1.3 to 37.8±1.6) after giving intervention. Significant improvement was seen in symptoms of daytime sleepiness, witnessed apnea, and snoring intensity.[22]

Discussion

In the present study, the daytime sleepiness and risk of obstructive sleep apnea was found to be significant in experimental after giving oropharyngeal exercise intervention p=0.001, 0.01 respectively. The results were consistent with the findings of **Guimaraes** who reported the daytime sleepiness and risk of obstructive sleep apnea score in experimental group was significant p<0.005, p=0.02 respectively . [2]

In the present study, the mean snoring score of adults in experimental and comparison group after intervention was 11.43±5.42 and 15.13±5.16 respectively (p=0.01). The findings were consistent with **Shadman nemati et.al** who reported the mean snoring scale score after the intervention in control and experimental group was 7.01±1.72, 3.09±2.7 respectively (p=0.000).[29]

Conclusion

The goals of oropharyngeal exercises are to tighten and strengthen the upper respiratory muscles at the back of the mouth, within the throat, and at the front of the neck. With the help of evidence based practice, literature can be added into the body of nursing knowledge to help the nurses and other health care professionals to reduce the problem of sleep related disturbances among people. Researchers should focus more on this area related to sleep disorders as most of the times people are unaware of their sleep related problems and less attention is given towards it.

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Ethical Clearance- Institutional ethical committee (IEC- 959) of Maharishi Markandeshwar (Deemed to be University), Mullana.

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