Original Article

Does 'weight reduction' help all adult snorers?

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ABSTRACT

Background: Obesity is now a global epidemic. Obese people are at higher risk of snoring. Weight reduction could influence the prevalence of snoring. Present study tried to find out, whether weight reduction is of benefit in all adult snorers. **Materials and Methods:** It is a cross sectional study, on 349 subjects (196 males and 153 females). They and their spouses were asked for snoring habits. Their neck circumference, height and weight was measured and Body mass index (BMI) was calculated, and they were classified into low normal, high normal, pre-obese and obese BMI groups. Prevalence rates of snoring in different groups were compared, to find out any statistically significant difference, between them. **Results:** Statistically significant difference, in prevalence rates of snoring was found, when obese and pre-obese group were compared with normal BMI group, separately. No significant difference was found in prevalence rates, when comparison was made between obese and pre-obese group. Difference in prevalence of snoring, was also not significant, when comparison was made between low normal and high normal BMI groups. Neck circumference of snorers was significantly more than the neck circumference of non-snorers in all BMI groups. Gender wise difference, in prevalence of snoring was also not significant. **Conclusion**: Body mass index target needs to be set at 25 kg/m^2, in weight reduction programmes, to achieve clinically relevant response in a snorer. There is no need to put extra emphasis, on further reduction of BMI. Weight reduction, is not helpful in all adult snorers, especially those with normal BMI, where other causes of snoring, like fat around upper airways, need to be considered.

KEY WORDS: Adult, body mass index, obesity, snoring, weight reduction

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INTRODUCTION

Obesity is now a global problem[1] having epidemic proportions, in western societies[2,3] as well as in India.[4-6] It is one of the strongest risk factors for obstructive sleep apnoea (OSA).[7,8] Body mass index (BMI) is now an established criteria for defining and classifying obesity,[9] with some doubts raised for its applicability in elderly population.[10] People with high BMI are at higher risk for OSA, snoring and various sleep disorders.[11] Apart from obesity, male gender and post menopausal women are also considered to be a determinant of snoring,[12] and hormone replacement therapy (HRT) in these women, appears to protect them from it.[13] Snoring is also thought to be a reason for cardiovascular diseases[14-16] and increased mortality.[17] Fat deposition in the tissues surrounding the upper airway and central obesity, appears to result in a smaller lumen and increased collapsibility of the upper airways.[18-20] Changes in BMI are found to influence snoring.[21] Considering these issues, present study, was undertaken to assess, whether achieving lower BMI, by weight reduction could benefit a snorer with either normal and above normal BMI.

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MATERIALS AND METHODS

Present study is a cross sectional study, conducted at Nehru Hospital affiliated to Baba Raghav Das Medical College, Gorakhpur, India which is a tertiary care centre in Northern India. The study was conducted from April 2010 to May 2011. Our target was to select 400 apparently healthy adult individuals for this study. Willing attendants of patients admitted in various wards of Nehru Hospital who matched our inclusion criteria were selected from clinical wards with odd serial number beds.

Inclusion criteria

1. Apparently healthy attendant of patients admitted to

different wards of Nehru Hospital
2. Attendants whose spouses were available for interview
3. Attendants whose BMI was ≥18.5

Exclusion criteria

1. Unwilling Individuals
2. Attendants with history of alcoholism, smoking or prolonged use of anxiolytic/sedative drug
3. Associated respiratory, renal, hepatic or cardiovascular disease
4. Upper respiratory tract infection within past one week.
5. Pregnancy

Investigators approached 400 different individuals, out of which 51 were rejected, as they either did not meet inclusion criteria, or they refused to participate in study. Remaining 349 subjects were thoroughly explained about the details of the study, and a written consent was taken. Subsequently subjects along with spouse were taken into different rooms, with different investigators to eliminate bias. These subjects were interviewed and examined, by the two investigators separately, and their body weight was recorded in kilograms up to one place decimal, in erect posture without shoes and wearing only light clothes with an electronic scale. Height and neck circumference was measured in centimetre up to one place of decimal and with the help of scale mounted on a wall. BMI was calculated up to two places of decimal with the help of formula, BMI = body weight/Height^2 (kg/m^2). The data collected from both the partners was examined and compared by a different observer. The data were recorded on a spreadsheet and for statistical analysis Epi Info (TM) 3.5.3 was used. The BMI was divided into three groups as normal (18.5 – 24.99), pre-obese (25 - 29.99) and obese (>30). The normal group was again divided, into two groups, as low normal (≥18.5 – <22) and high normal (≥22 - <25). Chi-square test was used for comparison of proportions, and student's *t* test was used to compare difference in means. A *P* value < 0.05 was judged to be statistically significant.

RESULTS

Of total 349 subjects, 196 (56.1%) were males and 153 (43.9%) were females. Total 93 (26.6%) subjects were found to be snorers. Out of total males, 59 (30.2%) were snorers and of total females 34 (21.5%) were snorers. A table was drawn comparing the normal, pre-obese and obese subjects in snorers and non snorers [Table 1].

Chi square test was applied to above table and then following outcomes were found.

1. χ^2 (Difference between snoring habits of normal BMI and Pre-obese) = 16.56; df = 1; $P < 0.001$
2. χ^2 (Difference between snoring habits of normal BMI and Obese BMI) = 21.01; df = 1; $P < 0.001$
3. χ^2 (Difference between Snoring habits of Pre-obese BMI and Obese BMI) = 1.93; df = 1; $P > 0.05$
4. χ^2 (Gender wise difference between snoring habit of normal BMI individuals) = 3.55; df = 1; $P > 0.05$
5. χ^2 (Gender wise Difference between snoring habit of Pre-obese individuals) = 1.14; df = 1; $P > 0.05$
6. χ^2 (Gender wise difference between snoring habit of obese individual) = 0.17 (Yates corrected); df = 1; $P > 0.05$

Table 1, shows that, snoring habit was more common in pre-obese and obese individuals in comparison to individuals with normal BMI and, differences were statistically significant (*P* value <0.001). There was no significant difference in snoring habits of pre-obese and obese individuals ($P > 0.05$). No gender wise difference in snoring habit was observed in intra-class comparison of male and female individuals belonging to normal, pre-obese and obese BMI (All $P > 0.05$).

Table 2 shows, comparison of snoring habit between low normal and high normal BMI. It assesses whether a lower BMI in the normal range would result in lower snoring habit. We observed that difference in snoring habits between low normal and high normal BMI was not statistically significant ($P > 0.05$).

Table 3 compares snoring habits in different BMI groups, that is low normal, high normal and above normal BMI in relation to neck circumference. It assesses whether people with lower neck circumference in each BMI groups are less prone to snore in comparison to people with high neck circumference in the same BMI group. The difference in neck circumference between snorers and non snorers in each of BMI groups was statistically significant ($P < 0.05$).

DISCUSSION

It has been found in longitudinal studies that, even modest weight reduction is likely to be effective in managing and reducing the new occurrence of sleep disordered breathing (SDB).[21-23] Same results are reflected in present cross sectional study, [Table 1] where the prevalence of snoring as surrogate of sleep disordered breathing was significantly lower in persons of BMI in normal range, as compared to those in range of pre obese or obese; but lack of significant difference, in prevalence of snoring among overweight and obese, points towards the fact that just by reduction of BMI from obese to pre obese range, is not enough to help the snorers. They in fact need to reduce their BMI to less than 25 kg/m^2 that is in normal range. Peppard *et al.*[22] did their longitudinal study on 690 adults and concluded that obesity is likely to be causal in persons with sleep disordered breathing, and weight reduction, could be helpful in these people. Sieqfried *et al.*[23] did their study on 38 extremely obese adolescents, and they concluded that weight reduction is good for OSA, but for snoring, its role might be overestimated. This difference could be explained by saying, that this study, was on comparatively lesser sample size, and subjects recruited were not adults. Marchesini *et al.*,[24] Analyzed the association of snoring

Table 1: Comparison between snorers and non snorers in relation to BMI and gender

	Normal BMI (Kg/m^2)			Pre-obese BMI (Kg/m^2)			Obese BMI (Kg/m^2)		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Snorers	34	16	50	34	16	50	34	16	50
Non snorers	113	99	212	113	99	212	113	99	212

Table 2: Comparison of snorers and non-snorers in relation to low and high normal BMI

BMI (Kg/m2)	Snorers	Non-snorers
Low normal BMI (≥18.5 - <22)	26	132
High normal BMI (≥22 - <25)	25	80

χ^2 Difference between snorers and non-snorers in low normal BMI and high normal BMI = 2.18; df = 1; $P > 0.05$.

Table 3: BMI-wise relationship of neck circumference with snoring

BMI	Snoring present		Snoring absent		T df *P*-value
	n	Mean neck circumference (in cm) ± SD	*n*	Mean neck circumference (in cm) ± SD	
18.5-22.0	25	32.7 cm±2.6 cm	132	31.3 cm±2.4 cm	T=2.66 df=155 *P*<0.05 (S)
22.0-25.0	25	34.2 cm±3.1 cm	80	32.8 cm±2.6 cm	T=2.13 df=103 *P*<0.05 (S)
>25.0	42	35.9 cm±2.7 cm	45	34.4 cm±2.9 cm	T=2.50 df=85 *P*<0.05 (S)

with, diabetes, hypertension and physical activity in 1890 obese patients, and found that physical activity, protects the obese people against snoring, which is again in congruence with our findings.

Present study also tried to find out, whether reduction of BMI, to values below 25 Kg/m^2, could further reduce the prevalence of snoring. It was done by dividing the normal BMI group into high and low normal by taking BMI value of 22 Kg/m^2 as cut off limit [Table 2]. The difference, in prevalence of snoring, among high and low normal BMI subjects, was not statistically significant. This finding of prevalence of snoring in people of normal BMI is in congruence with Dzieciolowska-Baran *et al.*,[21] who found that, instead of weight reduction, correction of anatomical abnormalities of upper airways could be a better way to control snoring in persons of normal BMI. It also points towards the fact that obesity might not be the only cause of snoring, and other causes also deserve to be addressed and corrected. In this light, present study also tried to find out whether reduction of neck circumference, as an indicator of fat around upper airways, could be of some help, among snorers of different BMI groups [Table 3]. It was found that mean neck circumference, of snorers was significantly higher than mean neck circumference of non snorers, among subjects of normal as well as above normal BMI groups. It highlights the fact that reduction of BMI by weight reduction regime may be helpful to an extent only, and fat around upper airways also need to be reduced, at least in snorers of normal BMI. This finding is in congruence with the findings of Sutherland *et al.*[20] and Onat *et al.*,[19] who emphasised upon fat around upper airways as, an important contributor of SDB. It further confirms, already established criteria of targeting weight reduction to BMI to at least, 25 Kg/ m^2, so as to achieve, clinically successful treatment of snoring. There appears to be no need to, exhaust the resources, in putting extra emphasis, on weight reduction in snorers with normal BMI. Peppard *et al.*,[22] in their study, were also not able to support the association of weight loss, and reduced sleep disordered breathing, in normal weight persons with this problem.

Previous literature says that male gender[12] and post menopausal women[13] are associated with snoring and other SDB problems. Knuiman *et al.*[12] in their study on 967 adults, found male gender, as a determinant of snoring, and Bixler *et al.*[13] on a large sample size of 12219 women and 4364 men, found pre menopausal women and post menopausal women on HRT, at a lower risk of sleep related breathing problems. Present study evaluated this gender wise difference in snoring, by doing intra group comparison of prevalence of snoring between two genders, among subjects of normal, pre-obese and obese BMI, but we could not find any significant difference in between two genders, in any of the groups. This difference in study results could be due to vast difference in sample size, between our study and previous studies.

CONCLUSION

Obesity and pre obesity, continues to be a risk factor for snoring, and BMI targets need to be set at 25 Kg/m^2, in weight reduction programmes, to achieve clinically obvious response in subjects with snoring. There is no need to reduce BMI, to values further below 25 Kg/m^2. Weight loss is appropriate to be followed as a strategy of managing snoring, in obese and pre obese people, but other causes, like fat around upper airways, also need to be addressed in snorers with normal BMI. There appears to be no higher prevalence of snoring among male subjects, and this further necessitates a study, with larger sample size. The effect of female sex hormones on prevalence of snoring also needs to be addressed and investigated. Finally it is to be said that all adult snorers, are not going to be benefited by weight reduction.

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