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Impact of lifestyle modifications on snoring and mild sleep apnoea patients

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Abstract

Objective. Behavioural modification through increasing nutritional awareness, along with customised dietary changes and education about physical inactivity, for obese snorers and mildly sleep apnoeic patients would help improve their quality of life.

Methods. A one-year prospective interventional study enrolled snorers and/or mild obstructive sleep apnoea sufferers, with 36 patients each in the test group and control group. Nutritional information and tailor-made diet charts were given to the 36 test subjects. The severity of snoring and daytime sleepiness after 6 and 12 months was compared using the Epworth Sleepiness Scale and Thornton Snoring Scale as measures of quality of life.

Results. Subjective scores on both scales showed highly significant improvement ($p \leq 0.001$) in the test group. No significant improvement was seen in the control group.

Conclusion. Awareness of basic nutrition and customised diet plans help to achieve behavioural modification in the long term, resulting in a better quality of life.

Main Article

Dr S Bansal takes responsibility for the integrity of the content of the paper

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Introduction

Sleep-related breathing disorders are becoming endemic, and a root cause of morbidity and mortality amongst the overweight and obese population of the world. Obstructive sleep apnoea (OSA) is the most common of the sleep-related breathing disorders, and snoring is the most important symptom.[1] Snoring is amongst the most common disorders that lead to conflict with the bed partner or others sharing the room.

Progression on the apnoea/hypopnoea index is mainly dependent on weight gain and, to a lesser degree, on time. Of these two factors, the effect of weight increase exceeds that of time almost seven-fold, playing a major role in apnoea/hypopnoea index progression.[2] For a simple snorer or even a mildly sleep apnoeic patient, most of the medical and surgical modalities would be neither acceptable nor warranted. Therefore, weight management by lifestyle modification, which mainly includes dietary modifications that aim to alter unhealthy eating practices and maintain a healthy eating pattern as a behavioural therapy, remains the mainstay of treatment.

Literature showing the effect of weight loss on OSA remission has been found to have some limitations on methodological grounds, and the more recent studies assessing the effect of weight loss on OSA severity and outcomes were in the context of bariatric surgery.[3] Many studies have documented the positive effects of very low-calorie diet plans, with improvement in the degree of OSA,[4,5] but the drawback is the inability to sustain such diets in the long run. These diets seem to be very good for experimental purposes and to prove the point that very low-calorie consumption leads to weight loss, which reduces the chance of OSA. The other factors that lead to failure to maintain weight loss for long are poorly designed weight loss parameters and poor follow up. This explains the mixed response to weight loss programmes.[6] Unfortunately, weight loss through diet, exercise and/or medications has been hard to achieve and maintain.

This study aimed to investigate the effect of customised diet plans (diets based on the lifestyle and eating habits of patients, which are good in terms of satiety and to the patient's liking), so that patients can sustain the diet throughout life, and develop good eating habits and improve their quality of life post intervention; this can be a useful adjunct to the armamentarium of an otolaryngologist.

Materials and methods

In this prospective interventional trial, 72 adult patients diagnosed with snoring or mild sleep apnoea according to the apnoea/hypopnoea index on polysomnography were enrolled from January 2017 to December 2017. Informed consent was obtained from all patients. Permission from the institute ethics committee was obtained (approval number: INT/IEC//2017/1286).

Polysomnography

Patients who were only snorers or suffering from mild sleep apnoea (i.e. with an apnoea/hypopnoea index of less than 15 events per hour on polysomnography) were included in

Table 1. Demographic profile of subjects in groups A and B

Parameter	Group A	Group B
Age (years)		
– Mean (SD)	43.1 (10.25)	45.7 (9.56)
– Range	20–67	28–60
Weight (kg)		
– Mean (SD)	87.4 (12.27)	87.14 (11.59)
– Range	70–110	65–105.5
BMI (kg/m^2)		
– Mean (SD)	31.2 (2.33)	29.88 (3.01)
– Range	25.7–36.9	25.4 –34.6
AHI events per hour		
– Mean (SD)	9.93 (3.34)	9.6 (3.22)
– Range	4.3–14.8	4.2–14.3

SD = standard deviation; BMI = body mass index; AHI = apnoea/hypopnoea index

the study. A level 1 sleep study (polysomnography) was conducted using a Philips Alice PDx portable sleep diagnostic system.

Inclusion criteria

These were: snorers and mildly sleep apnoeic patients on polysomnography; self-reports of daytime somnolence; and willing to sign an informed consent form.

Exclusion criteria

These were: any other severe co-morbidity; pregnant or planning to become pregnant; and major depression or a non-stabilised psychiatric disorder.

Nutritional status

Dietary intake

Information regarding the dietary intake of all sample subjects was obtained using standard techniques such as the 24-hour recall method and food frequency questionnaires. The macronutrients were calculated using nutritive value tables.[7]

Anthropometric assessment

All snoring or mildly sleep apnoeic patients had their body parameters measured using standardised anthropometric techniques and instruments.[8] Body mass index (BMI) was calculated using weight and height measurements in kilograms and metres, respectively.

Lifestyle modification

Patients were divided into groups A and B based on computer-generated simple randomisation. The groups were not specifically matched for socioeconomic status, but the patients were from a similar background and of a similar status – our tertiary care hospital, which is a public hospital, caters for low- to middle-income patients.

As the majority of our patients are vegetarians, with a few consuming non-vegetarian foods once a fortnight, they were also not segregated according to their dietary patterns or analysed separately.

Diet

Group A included 36 patients. These patients were given nutritional knowledge classes on food values, dietary requirements according to ideal body weight, and energy expenditure components and ways to enhance these, and so on. Food perceptions and misconceptions about some foods considered to be healthy by study subjects because of advertisements or lack of awareness were clarified.[9] History of alcohol intake was also elicited, and its impact on snoring and its calorific value were explained to the patients in this group. Energy intake was adjusted according to the activity level of the patient, and not less than 50 per cent of the energy was derived from carbohydrates, mainly from complex sources. Patients were then provided with tailor-made dietary plans with carbohydrate and protein exchange lists so that they could have variety in their daily meals and could include food from all food groups.

Group B included 36 patients, who were not given nutrition classes or advice on any special dietary or lifestyle modification. Instead, they were given general instructions at the beginning of the study to manage their weight by avoiding junk food.

Physical activity

Physical inactivity was documented to make patients aware of their sedentary lifestyle and encourage them to improve their physical activity status.

Patients were encouraged to count their daily steps, monitor their exercise schedules in applications on their smart phone (if they had one), and to take at least 10 000 steps (about 8 kilometres or 100 minutes of walking per day) as a target. Simple exercise measures, like taking a ramp or stairs instead of a lift, parking their vehicle a little further away from their place of work, and taking a 10–15-minute walk after every meal, were discussed with patients. Exercise schedules best suited to patients, such as brisk walking, playing badminton and swimming, were encouraged.

Parameter recording and questionnaires

Anthropometry and nutritional intake were recorded every three months throughout the study period, in order to assess patients' compliance and progress in the test group and to keep a record of any changes in the control group.

The questionnaires used were the Epworth Sleepiness Scale[10] and the Thornton Snoring Scale.[11] All the parameters and measurements were compared after 6 and 12 months of intervention.

Statistics

SPSS version 22 software (SPSS, Chicago, Illinois, USA) was used for statistical analysis. Means and medians were calculated for all quantitative variables; standard deviations or interquartile ranges were calculated for measures of dispersion. Normality of data was checked using Kolmogorov–Smirnov tests of normality. Normally distributed data were compared using the paired *t*-test. For time-related (pre- and post-intervention) variables of skewed data, the Wilcoxon signed rank test was applied. A *p*-value of less than 0.05 was considered significant.

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Table 2. Nutritional status before and after intervention for group A

Parameter	Baseline (mean (SD))	At 6 months (mean (SD))	At 12 months (mean (SD))	P-value – baseline *vs* 6 months post-intervention	P-value – baseline *vs* 12 months post-intervention
Weight (kg)	87.4 (12.3)	81.12 (10.9)	74.7 (10.3)	<0.001	<0.001
BMI (kg/m^2)	31.19 (2.3)	28.9 (2.1)	26.69 (2.08)	<0.001	<0.001
Energy (kcals/day)	3054 (1003)	2358 (669)	1904 (417)	<0.001	<0.001
Protein (g/day)	86.74 (36.83)	83.22 (17.19)	82.05 (9.45)	0.451	0.594
Fats (g/day)	115.78 (51.84)	75.2 (19.7)	52.7 (11.6)	<0.001	<0.001
Carbohydrates (g/day)	400.77 (165.5)	336.85 (132.15)	275.42 (71.2)	<0.001	<0.001

SD = standard deviation; BMI = body mass index

Table 3. Nutritional status before and after intervention for group B

Parameter	Baseline (mean (SD))	At 6 months (mean (SD))	At 12 months (mean (SD))	P-value – baseline *vs* 6 months post-intervention	P-value – baseline *vs* 12 months post-intervention
Weight (kg)	87.14 (11.59)	88.76 (10.45)	88.11 (11.08)	0.535	0.718
BMI (kg/m^2)	29.88 (3.01)	30.46 (2.97)	30.29 (2.9)	0.413	0.558

SD = standard deviation; BMI = body mass index

Results

The distribution of patients' demographic data is shown in Table 1.

Nutritional status

Nutritional intake

The baseline mean energy, fat and carbohydrate intake was reduced significantly at both 6 and 12 months ($p < 0.001$) in the test group (group A) (Table 2). The mean protein intake was reduced marginally but not significantly. The control group (group B) did not show any significant change in nutritional intake or status (Table 3).

Anthropometry

A significant ($p < 0.001$) change was observed in mean weight difference as well as in BMI at 6 months and at 12 months post intervention in patients in group A (Table 2). No significant change was observed in the patients in group B (Table 3).

Physical activity status

In group A, after 12 months' follow up, 56 per cent of patients ($n = 20$) were able to maintain an average of 10 000 steps per day at least five times a week, which was recorded on their smartphones or measured by the patient according to number of kilometres walked or the duration of walks (10 000 steps = 8 kilometres or 100 minutes); 33.3 per cent of patients ($n = 12$) achieved 8000 steps. Of the patients, 10.7 per cent ($n = 4$) were swimming and walking intermittently, as per their choice, and hence were not able to keep an exact record. Physical inactivity was reduced from 8 waking hours to 2 waking hours a day. The control group did not show any elevation in their physical activity levels.

Quality of life

The mean Epworth Sleepiness Scale and Thornton Snoring Scale scores reduced significantly ($p < 0.001$ at both 6 and 12 months) for group A (Table 4), while no such significant changes were seen for group B (Table 5).

Discussion

Snoring and mild sleep apnoea, when ignored, may develop into moderate and severe OSA with progressive weight gain.[12] Our study demonstrated that a customised diet chart based on awareness and knowledge about one's body status, in terms of BMI, physical inactivity level and nutritional requirements, and clearing up food misconceptions, helped patients to achieve sustained weight reduction. This intervention brought about a behavioural change, and improved the quality of life of patients and their partners, as seen from improvement in the questionnaire scores.

Various studies have documented the effects of very low-calorie diets on obese OSA patients as an adjunct to other medical therapies such as continuous positive airway pressure as well as surgical interventions.[13] A small randomised group of subjects (70 per cent male, mean BMI = 32 kg/m^2) with mild, mostly supine-position-predominant OSA (mean apnoea/hypopnoea index of 10 events per hour) were subjected to a 600–800 kcal/day diet plus supervised lifestyle counselling or routine lifestyle counselling over one year of study.[5] The treatment group was rigorously followed, with 14 visits over one year, each lasting 60–90 minutes. At one year, the treatment group had lost just over 10 kg of weight, associated with a reduction in apnoea/hypopnoea index of 4 events per hour, whereas the control subjects lost an average of 2.4 kg without measurable changes in apnoea/hypopnoea index. Longer-term follow up is needed to determine the durability of such lifestyle modifications, but the rigour of this protocol raises the issue of whether such costly and time-intensive programmes are of value in those with milder OSA.

In another study on weight loss and OSA, eight obese OSA patients were put on a very low-calorie diet, with a calorie range of 420–800 kcal per day. The patients' mean weight and BMI reduced significantly ($p \leq 0.05$), while apnoea improved in six patients after two to three months of dietary intervention.[4]

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Table 4. Epworth Sleepiness Scale and Thornton Snoring Scale scores before and after intervention for group A

Parameter	Baseline (mean (SD))	At 6 months (mean (SD))	At 12 months (mean (SD))	P-value – baseline *vs* 6 months post-intervention	P-value – baseline *vs* 12 months post-intervention
Epworth Sleepiness Scale score	11.2 (1.4)	9.3 (1.1)	6.19 (0.92)	<0.001	<0.001
Thornton Snoring Scale score	7.00 (0.72)	5.72 (0.7)	3.2 (0.56)	<0.001	<0.001

SD = standard deviation

Table 5. Epworth Sleepiness Scale and Thornton Snoring Scale scores before and after intervention for group B

Parameter	Baseline (mean (SD))	At 6 months (mean (SD))	At 12 months (mean (SD))	P-value – baseline *vs* 6 months post-intervention	P-value – baseline *vs* 12 months post-intervention
Epworth Sleepiness Scale score	12.5 (2.2)	13 (2.5)	12 (1.7)	0.371	0.284
Thornton Snoring Scale score	7.00 (0.67)	7.00 (0.89)	7.12 (0.60)	1.000	0.426

SD = standard deviation

In contrast to these studies, our study did not focus on drastically reducing carbohydrates or calories. Measured calorie reductions (not less than 20 kcal/kg body weight) were made stepwise, and more focus was given to improving the quality of nutrients, which automatically reduced the quantity. Good protein sources in the diet were one of the main contributing factors to weight loss, because the specific dynamic action or thermic effect of protein-rich foods is greater.[14] Fat intake was modified, and omega 3 and 6 fats were increased by adding nuts and seeds to the diet instead of the trans-fats found in bakery items. Carbohydrate sources were shifted from simple to complex. Food perceptions about certain foods that falsely seemed healthy because of lack of awareness were clarified,[9] which helped patients to follow a healthy diet plan. In our study, patients were helped with the diet charts, which were tailor-made for them with their lifestyle in mind. Patients reduced their intake from an average of 3054 ± 1003 kcal per day, to 2358 ± 669 and 1904 ± 417 kcal after 6 and 12 months, respectively, with the help of judicious diet and lifestyle counselling.

- Awareness and knowledge about basic nutrition, and its application in the form of customised diet plans, help in long-term behavioural modification
- These methods help patients sustain their diet plans long term
- Such awareness and application also significantly improve snoring intensity and daytime sleepiness, and hence quality of life

In a four-month diet and exercise programme aimed at improving the clinical outcomes of 10 (predominantly female) patients with OSA, researchers used Optifast nutraceutical shake (160 kcal and 14 g protein per serving; Novartis, Basel, Switzerland) as a meal replacement in a very low-energy diet, with a regimen of five sessions a week of aerobic exercise for 16 months.[15] Snoring improved significantly in most of the subjects, with an average reduction of 9.6 kg in weight.

We were able to achieve a highly significant reduction in weight (Table 2) and in BMI, as well as significant improvements in Thornton Snoring Scale and Epworth Sleepiness Scale scores (Table 4) in a 12-month lifestyle programme that focused mainly on behavioural changes in diet, without the use of any nutraceutical slimming shakes, in a much bigger sample size than in the above study.[15] The interventions used in Barnes and colleagues' study[15] require monetary support, because daily slimming shake consumption and enrolment in monitored aerobic and resistant training sessions is costly. The favourable results of our study, in contrast, were achieved without any extra monetary burden for patients in terms of diet or physical activity enhancement.

Furthermore, short-term intense diet and exercise programmes might face compliance issues in the long run. In our study, we considered the weight loss programme a behavioural therapy that patients can continue in the long term. Our dietary plans were neither very low calorie nor very low carbohydrate. Instead, our study utilised scientific techniques to help patients adhere to the dietary plans, including: feeding the patients with the appropriate calculated number of calories and scientific distribution of macronutrients, providing a thorough explanation of the basic components of energy expenditure by their body, and demonstrating steps to enhance their basal metabolic rate.

Conclusion

Snoring, with or without sleep apnoea, is a social and a personal obstacle to a healthy body and mind. Snorers and mildly sleep apnoeic patients would not accept medical and surgical modalities as first-line therapy; therefore, lifestyle modification remains the mainstay for such patients, and is a very useful treatment available to otolaryngologists as part of a multidisciplinary approach.

Awareness and knowledge of basic nutrition and its application, along with implementation in the form of customised diet plans (offered during this study according to the needs of the individual's body), contributed to long-term behavioural modification, helping the patients sustain their diet plans, develop good eating habits and attain significant improvements in quality of life parameters.

Competing interests. None declared

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