Food Perceptions of Obstructive Sleep Apnea Patients

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Abstract: Background: Obese people have extrinsic narrowing of the area surrounding the collapsible region of the pharynx which may lead to a periodic collapse of the upper airway during sleep leading to obstruction of the airway (OSA). Objective: Initial assessment of current food perceptions, patient-perceived barriers to healthy eating. Methods: A survey, which contained free response questions, yes or no statements, 24-hour recall and Epworth Sleepiness Scale Questions was utilized. Results: Of the 64 surveys collected (56 males and 8 females), 43.24 % patients were overweight, 43.2% were obese grade-1, 9.9% obese grade-2 and 6.25% obese grade-3. Awareness of relation of obesity and CVD, diabetes & OSA was 62%, 36% & 3.9% respectively. Fresh juice was considered to be healthier over fresh fruits by 35.6% and 73% perceived refined/olive oil to have fewer calories than animal fat. While 62.5% considered high fiber cookies as being healthy, 49.8 % patients considered ‘sugar-free' sweets to be calorie free and hence indulged. Of the subjects, 46% did not consider homemade potato pyramids or funnel cake as junk just because they were Indian snacks and homemade. Consumption of frozen foods and eating out was thrice and twice a week respectively due to food preparation barrier at home or celebrating weekends' culture. Food addiction/ food palatability to various spices and sauces used in outside food was reported. Epworth sleep scale showed most poor results in morbidly obese patients followed by obese grade 2 and 1. Conclusion: Nutrition surveys to gauge awareness about healthy eating are a must since lack of knowledge lead to many sound eating barriers in OSA patients.

Key Words: Perceptions; Food; Apnea; Sleep

Introduction:
Obstructive sleep apnoea [OSA] is a disease characterized by repetitive narrowing or periodic collapse of the upper airway during sleep.[1] As a result, there is apnoea, hypopnoea, or both due to complete or partial obstruction of the airway.

Several population-based studies have shown the prevalence of Obstructive sleep apnoea [OSAS] to be 0.3–5.1% [2–6]. In India especially amongst the urban population, there is an increase in incidence due to changes in the lifestyle. Prevalence of OSA and OSAS among Indian population is 9.3 and 2.8 respectively.[7] Increase in some diseases and lifestyle disorders like hypertension, cardiovascular disease, stroke, pulmonary hypertension, cardiac arrhythmias, and altered immune function is attributed to OSA. Motor vehicle accidents occur commonly due to dozing off.[8] Every 10 kg increase in the weight increases risk of sleep apnoea by two times. Every increase in BMI by six increases risk by four times[2]. Morbid obesity with a BMI greater than 40–44.9 kg/m² has been linked with reduced life expectancy and is one of the leading preventable causes of death worldwide.[5,6,9] Dietary weight loss reduces upper airway collapse by modifying anatomy and function in obese OSA patients; 13% of weight loss can decrease nasopharyngeal airway collapsibility in obese patients with OSA.[10] Therefore in obese patients, even minimal weight loss can be beneficial as it is thought to be related to preferential loss of visceral fat first as opposed to subcutaneous fat which has metabolic advantages.[11] Obesity is usually due to behavioral risk factors such as improper diet and lack of physical activity as well as due to genetic predisposition. Moreover, food availability, cost, meal preparation, cultural and social customs also lead to unhealthy eating habits.[3,4] Behavioral factors influenced by individuals lifestyle, culture, socioeconomic status, education and awareness status may lead to excessive caloric intake and inadequate energy expenditure due to lack of, or less of physical activity can be an explanation of most cases of obesity. [12] Other reasons which might lead to obesity may be genetics, psychiatric illness or medical problems.[13] Emergence of obesity as an endemic in today's developing and developed society is apparently due to easy availability and affordability of highly palatable unhealthy foods as well as lack of time for preparation of healthy food at home. [14,15] At present, food perceptions of OSA patients and barriers in healthy eating are unresearched. It requires a critical insight
through research of this specific population which will help
the medical and paramedical team in knowing about
limitations to healthy eating by this group and thus will further
help in improving upon the therapeutic strategies of tackling
OSA. Urgent emphasis needs to be there on inculcating
healthy food habits to be rooted deep within for keeping
common noncommunicable diseases (NCD) at bay and
nipping the branching of new NCD’S such as OSA.
This study provides an insight into the prevalent eating habits
and certain myths about foods which prevent healthy eating in
OSA patients especially the obese.

Materials and Methods:
All patients having OSA on polysomnography were enrolled
from out-patient Department of Otolaryngology of a tertiary
care hospital from July 2016 to September 2017. It was an
observational study. Informed consent was obtained from all
the patients before making them participate in food and
lifestyle survey and calculating their nutritional status.
When patients were called for the initial nutritional status
evaluation, seeing and documenting their lack of awareness
about healthy food as well as its relation to their present dietary
status, a questionnaire was formed to gauge health awareness,
knowledge, attitude and beliefs towards healthy eating and
regard to comorbidities and OSA. Epworth Sleepiness Scale
Questions were also used to obtain responses. One day food
recall was asked/ probed from the patients, starting from the
meal preceding the interview by using food models for
identifying the exact portion size. They were asked for their
awareness about healthy food items which included questions
about which fats and oils they considered better to use, their
opinion and frequency of consumption of sugar-free sweets,
and tinned juices, various beverages, sweet and salty
snacks, biscuits and frozen food usage. Patient’s age, gender,
height and weight was recorded to calculate their BMI; and
their target weight loss inquired if they had any weight goal in
their mind. Any family history of obesity or OSA was elicited.
Patients were asked about their concept of healthy foods,
weight gain (good, fair, and poor). The responses to various
questions regarding their perceptions of food intake and any
barriers to healthy eating were in the form of a yes or a no in
the questionnaire. There was no right or wrong answers. A 24
hour recall form was used to take their one-day food recall. A
total of 64 questionnaires were collected. Standard formula
was used to calculate body mass index in kg/m² using patient’s
height and weight measurement. Average, ratios and
percentages calculated for nutritional and lifestyle parameters.

Results
Majority of OSA patients were found to be men (88.28%) in
the total of 64 questionnaires collected (Table-1). The average
age of the patient was 43.23 ± 9.81 years (Range-20-67 years).
Among them, 51% of patients were pure vegetarian, 32% were
non-vegetarians, and 17% were 'vegetarians' (did not eat meat
OR vegetarians but ate egg). Of the patients, 13% had type-2
diabetes, 49% were hypertensive, 19% had NAFLD (non-
alcoholic fatty liver disease) and 29% had CVD (Cardiovascular
disease) (Table-2). Of the patients, 92% were
from urban areas whereas 8% had the rural background (Table
-1). Out of 64 patients (Table-3), 48 (43.24%) were
overweight (BMI 23.9-29.9 kg/m²) with a minimum BMI of
26.2 kg/m², 29% of these overweight subjects had some weight
goal to be achieved in their mind. Also, 48 patients (43.24%)
were obese grade-1(BMI 30-34.9 kg/m²); out of whom, 32% had
weight loss target in their mind with a specific weight
number; 11 patients (9.9%) were obese grade-2 (BMI 35-
39.9 kg/m²) and 4 patients (6.25%) were obese grade
3(BMI=40kg/m²). Of those who were grade -2 obese, 49% had
a target weight whereas of the obese grade -3 patients, 54%
had a target weight.

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<tr>
<th>Table 1: Demographics</th>
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<tr>
<td>Number of Subjects</td>
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<td>Age(years)</td>
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<td>Males</td>
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<td>Females</td>
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<td>Vegetarian</td>
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<td>Non-vegetarian</td>
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<td>Eggitarian</td>
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<td>Urban population</td>
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<td>Rural population</td>
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<th>Table 2: Underlying lifestyle diseases in OSA patients</th>
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<tr>
<td>Diabetes</td>
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<td>Hypertension</td>
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<td>NAFLD</td>
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<td>CVD</td>
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It was found that 62% of the patients showed awareness of
relation of obesity and CVD, 36% patients showed awareness
about obesity and diabetes, but only 3.9% showed awareness
about obesity and its link with OSA. None of the patients knew
anything about carbohydrate counting. Interestingly 64% of
patients rated all packaged foods like chips, etc., as junk food
but did not include packed salty fritters as junk food. Homemade
potato pyramids, funnel cake and vegetable fritters were not
categorized as junk food by 46% of patients; 73% of patients
felt that olive/refined oil is a healthier choice, has
fewer calories than animal fat and so can be used liberally in
their diet. And 62.5% of patients consumed a packet a day of
‘high fiber’ biscuits considering them to be a healthy food as
advertised (on average 3-4 cookies with bed tea, 3-4 biscuits
in evening tea and 2-3 biscuits on the go the whole day). When
asked about healthy juice, 35.6% answered as fresh juice being
healthy and consumed it as a part of breakfast or mid-morning
meal whereas 34% responded unsweetened packed juices to
be healthy and drank it as breakfast or mid-morning snack.

Amongst nonvegetarians, consumption of fresh chicken/mutton was on an average once a week, but frozen
items were eaten four times a week with alcohol, as the
evening snack or at dinner time. Usage of frozen vegetarian
foods like frozen potato fries, potato cutlets, vegetable cutlets
was found to be at least three times a week on an average as a
breakfast item, tiffin item, evening snack item or with alcohol
by vegetarian subjects. Eating out amongst urban population
was on an average twice a week but ordering food at home or
getting street food or hotel food at home was found to be thrice
a week. Of the patients, 49.3% were under the perception of
sugar-free sweets as being healthy and hence indulged. In 59%
of patients, fresh fruit was not a part of their diet, and 27% did
not have even one serving of vegetables as their daily diet.
Also, 43% of patients described cottage cheese dish as a
‘vegetable.’ Exercise routine (brisk walk, sports, swimming,
etc.) was found to be missing in all the subjects. Subjects
considered doing daily routine activities like household
chores, going to the nearby market as exercise. Average
energy intake of 64 patients per day was found to be
2886±1234 kcal, protein intake was 90.5±44.62 g, fat intake
was 109.50±59.55 g and carbohydrate intake was
375.68±155.69 g.
Obese patients exhibited average energy, protein, fat and carbohydrate intake at 2487±796 kcal/day, 80.37±43.55 gm/day, 94.88±45.33 gm/day and 318.8±135.84 gm/day respectively. In obese grade-1 patients, average daily energy intake was found to be 3000±299 kcal, 399.07±158.77 gm carbohydrates, 90.12±38.11 gm of protein and 110.50±62.53 gm of fat.

Obese grade-2 patients showed average daily energy intake as 3470±788 kcal, 481.6±140.78 gm of carbs and 110.89±42.31 gm of protein and 123.2±37.81 gm of fat.

Obese grade-3 patients had an average intake of 4264±673 kcal/day, 549.9±72.43 gm of carbohydrate per day, 163.9±66.36 gm of protein per day and 169.9±72.43 g of fat per day (Table-4). Macronutrient intake (energy and protein) was found to be significantly more (p=0.01) in grade-3 obese patients followed by grade-2, grade -1 and overweight patients respectively. Energy intake was mostly from carbohydrates followed by fats and proteins.

The calorie intake of the study subjects was on an average 40 kcal/kg/day as compared to an ideal of 25-30 kcal/kg/day for a sedentary activity.

### Table 4: Macronutrient Intake as Compared to Recommended Dietary Allowances (RDA)

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<tr>
<th>Macronutrients</th>
<th>Intake in OSA Patient</th>
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<tr>
<td>% of Energy intake (Kcal/day)</td>
<td>48% more than RDA</td>
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<tr>
<td>% of Protein Intake (g/day)</td>
<td>17% less than RDA</td>
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<tr>
<td>% of Carbohydrates (g/day)</td>
<td>15% more than RDA (of which 38% were simple carbohydrates)</td>
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<tr>
<td>% of Fats (g/day)</td>
<td>39% more than RDA</td>
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### Discussion

Obstructive sleep apnoea is fast developing as a significant product of noncommunicable disease biggest trigger; that is obesity. Healthy lifestyle modification in which taming one's diet forms the most critical part can be the only preventive and curative measure for the same. It is probably because as and when the magnitude of problems (difficulty in breathing/snorin/sleep apnea/obesity-related health issues) increased, people wanted to achieve their target weight to avoid medical complications. The importance of losing weight without causing any significant co-morbidity should be advocated by all clinicians since obesity strongly correlates with increased risk of long-term lifestyle diseases. Obesity and its relation to OSA was lacking in all the patients. It was found that 62% of the patients showed awareness of association of obesity and CVD, 36% patients showed awareness about obesity and diabetes but only 3.9% showed awareness about obesity and its link with OSA. This is because OSA is not yet declared a Noncommunicable disease (NCD) unlike diabetes and heart problems and is not on preventable disease public forum, so hence negligible awareness was found regarding OSA in relation with obesity. This impartment of knowledge seems urgent seeing the fact that even 10% of weight loss significantly decreased AHI (Apnea Hypopnea Index) from 24.3 to 2.9 in morbid obese OSA patients[16]. Any increase in BMI by one standard deviation leads to a risk elevation by four times of having an AH greater than five per hour.

In obese grade-1 patients, average daily energy intake was found to be 300±299 kcal of energy, 399±158.77 g of carbohydrates, 90.1±38.1 g of protein and 110.5±62.5 g of fat. Obese grade-2 patients showed average daily energy intake as 3470±788 kcal, 481.6±140.78 g of carbs and 110.89±42.31 g of protein and 123.2±37.81 g of fat. Obese grade-3 patients had an average intake of 4264±673 kcal/day, 549.9±72.43 g of carbohydrate per day, 163.9±66.36 g of protein per day and 169.9±72.43 g of fat per day (Table-4).

Macronutrient intake (energy and protein) was found to be significantly more (p=0.01) in grade-3 obese patients followed by grade-2, grade -1 and overweight patients respectively. Energy intake was mostly from carbohydrates followed by fats and proteins.

The calorie intake of the study subjects was on an average 40 kcal/kg/day as compared to an ideal of 25-30 kcal/kg/day for a sedentary activity.

Obese patients showed increasing tendency to have weight goals, with obese grade 1, 2 and 3 showing goal weight percent at 32, 49 and 50 respectively. It is probably because as and when the magnitude of problems (difficulty in breathing/snorin/sleep apnea/obesity-related health issues) increased, people wanted to achieve their target weight to avoid medical complications. The importance of losing weight without causing any significant co-morbidity should be advocated by all clinicians since obesity strongly correlates with increased risk of long-term lifestyle diseases. Obesity and its relation to OSA education were lacking in all the patients. It was found that 62% of the patients showed awareness of association of obesity and CVD, 36% patients showed awareness about obesity and diabetes but only 3.9% showed awareness about obesity and its link with OSA. This is because OSA is not yet declared a Noncommunicable disease (NCD) unlike diabetes and heart problems and is not on preventable disease public forum, so hence negligible awareness was found regarding OSA in relation with obesity. This impartment of knowledge seems urgent seeing the fact that even 10% of weight loss significantly decreased AHI (Apnea Hypopnea Index) from 24.3 to 2.9 in morbid obese OSA patients[16]. Any increase in BMI by one standard deviation leads to a risk elevation by four times of having an AH greater than five per hour.

Indian diets are rich in carbohydrates, but when asked about knowledge about carbohydrate counting, no patient answered on a positive note. Therefore, it becomes essential for health caregivers that obese patients should be made aware of the same. This point gets emphasized by the fact from the above survey that 62.5% of the patients confirmed at least a packet a day (75 g) of biscuits unaware of the fact that on an average two small (14 g each) or one large cookie is equivalent to carbohydrate of 1 Indian bread (chapatti). Interestingly patients don’t even count biscuits as an essential item to be told to the nutritionist/dietician during 24-hour recall intake that they consumed cookies. It always had to be probed that ‘do you eat biscuits with morning or evening tea?' And only then they came out with the answer. A case studies, showed that a diet low in carbohydrates might be an effective intervention for weight loss in obese patients with OSA[17].

Consuming a fresh fruit a day was not a part of diet regimen of 59% of patients. Fresh juice was considered to be a healthier option over fresh fruits by 35.6% of patients, being unaware of the fact that juice is without any fiber and the calorie as well as sugar content of one serving of juice over one serving of fruit would be more than double. Also, 34% of patients considered ‘unsweetened' packaged juices to be healthier over fresh juice or fruit as they were fascinated by the word ‘unsweetened' thinking them to be lower in calories and thus a healthier, readily available and ready to consume option despite these being sweet.

Patients were consuming packaged salty fritters as snacks did not consider them to be a significant source of calories despite the fact that 25 g (a hand full) of this type of meal gives approximately 150 kilocalories and 135 mg of sodium. Usage of refined oils was found to be rampant for cooking and frying since it was considered a low-calorie oil as compared to animal fat. Subjects were unaware of the fact that animal fat and the equal amount of vegetable oil has same calories. Another fact that came to light was that it seemed that nobody bothered to either read the nutritive value labeling or they did not understand due to sheer lack of awareness and knowledge.

Many studies have proved that consumers are getting confused with the information available on the nutrition label.[18] Usage of frozen foods both by vegetarian and nonvegetarian patients was found to be at least thrice a week emphasizing on the fact that patients perceived food preparation as a more significant barrier. This is also true for increased frequency of eating out or ordering food at home. One reason might be long working hours and thus celebration with ‘eating out’ or ‘ordering at home.' Food addiction/palatability is an also major issue to ponder upon as far as eating out or ordering fast food is concerned since it was considered a low-calorie option. One study has shown that those who purchase with enhanced palatability[19].

Patients reported no exercise routine in this survey and declared a Noncommunicable disease (NCD) unlike diabetes and heart problems and is not on preventable disease public forum, so hence negligible awareness was found regarding OSA in relation with obesity. This impartment of knowledge seems urgent seeing the fact that even 10% of weight loss significantly decreased AHI (Apnea Hypopnea Index) from 24.3 to 2.9 in morbid obese OSA patients[16]. Any increase in BMI by one standard deviation leads to a risk elevation by four times of having an AH greater than five per hour.
probably does not work well. A meta-analysis on weight loss techniques concluded that diet alone might give as good results for losing weight like diet and exercise together give. A

It is imperative and pertinent for a multidisciplinary approach to promoting a healthy lifestyle in a patient as well his family members since the patient eats what the family makes. Whole family’s literacy level and understanding of healthy food /meals need to be studied, rectified, monitored and reinforced. In patients suspected to be having OSA especially with obesity, a questionnaire can give a clue to the diagnosis. Risk factors, consequences, and treatment for OSA can be discussed with the patients since obesity is the most modifiable risk factor which can be tackled by all the above strategies thus minimizing hospital visits, medical bills, and invasive surgeries. Detailed probe into the beliefs and exposure to the kind of food during childhood and growing years along with his food habits about food timings, types and amount and his perception ab out his health and healthy eating is of utmost importance to gauge the nutrition-related literacy concepts and to rectify the same. Taste and palatability is a significant deterrent in developing good food habits, so healthy taste preferences should be groomed in children right from the beginning of their life. This is only possible if a family is well informed about right nutrition and healthy foods choices.

Conclusion
A lack of compatibility between what obese OSA patients ate and what they perceived to have eaten regarding nutritive value of their diet was majorly contributed by lack of knowledge and awareness and due to some misconceptions about certain foods. Weight loss needs to be a parallel strategy in OSA patients even with other medical and surgical interventions. Education is a method of prevention of obesity-induced sleep apnoea. Therefore, nutritionists and dieticians have an essential role to play in nutrition education with the co-operation of other medical team s to provide a better, consistent and rationale multidisciplinary approach to promote healthy eating amongst the patients.

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