ORIGINAL ARTICLE

Epidemiology of sleep disordered breathing in obese patients undergoing bariatric surgery in central India

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Abstract

Background: OSA is a rising problem amongst the Indian population in part due to adaptation of western lifestyle and in part to increasing awareness about the condition.

Objective

1. To analyze epidemiological risk factors of Sleep Disordered Breathing (SDB).
2. To analyze prevalence, type of sleep apnea, preferred therapeutic options in obese SDB.

Methods: A prospective observational study of 400 patients done in a Medical College Hospital in Central India in admitted patients for elective bariatric surgery.

Results: 90%, of the obese population irrespective of severity suffers from SDB, mostly in middle ages with asthma, hypothyroidism & type II diabetes mellitus being commonly associated conditions.

Conclusion: Obese patients have an extremely high incidence of SDB in the form of OSA.

Keywords: Epworth Sleepiness Score, Berlin Questionnaire, SDB, Hindi sleep questionnaire, Epidemiology, breathing, sleep disordered breathing (SDB), bariatric surgery, obese

Introduction

India as a nation is on the verge of regaining its tag of a golden bird, through the growth evident in its industrial, information technology & agricultural sectors. But the spark of India's growth is losing to the process of westernization as is evident from the rising trends of diseases like obesity and sleep disordered breathing. The two are claimed to be linked to each other since they are commonly seen predominantly in the affluent sections of the society.

Patients whose BMI lies in the obese or super obese range are considered to be at a high risk of developing sleep disordered breathing. Bariatric surgery is a treatment option that various centers spread across India are now offering for the treatment of obesity, apart from the dietary and life style modifications being practiced previously. Our study aims to study the life styles and habits of such obese patients presenting for bariatric surgery and understanding their sleep hygiene and also the lack of it.

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Graph 1: Comparison of prevalence of sleep disordered breathing as per sleep interview and polysomnographic analysis

Objectives

1. To understand, identify and correlate the sleep hygiene of obese individuals opting for surgery as a solution to obesity.
2. To identify the knowledge, attitude and practice gap amongst the subjects in regards to their own sleep status and available treatment options
3. To analyze the most commonly prevalent types of Sleep disordered breathing.

Methods

A prospective observational study of 400 patients done in a Medical College Hospital in Indore, Madhya Pradesh. Only patients with obesity admitted for purpose of elective bariatric surgery were included. The sleep study was performed as a part of the pre operative work up, sleep interview with the help of Epworth sleepiness score & Berlin questionnaire was used as a screening tool for assessing the awareness and analyzing the severity of the sleep disordered breathing prior to subjecting the patient to sleep study this was also done in order to triage patients for undergoing sleep study in days where there were two or more patients for evaluation.

The study data, questionnaire filling from patients and other work up was done by the authors with assistance from two well trained sleep study technicians. Data analysis was performed using Microsoft excel & word software and SPSS software [v21.0].

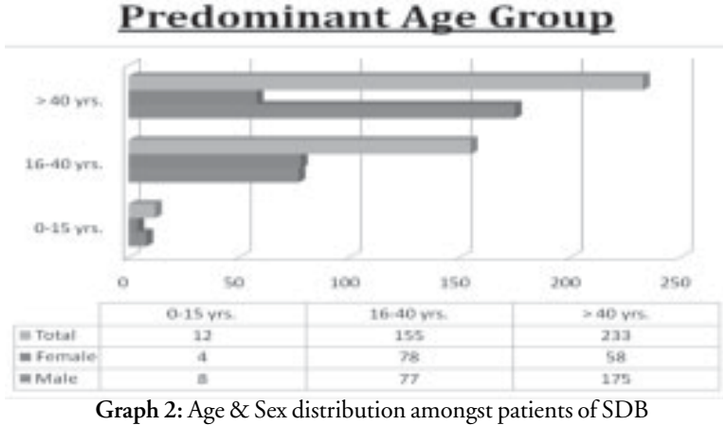
Institutional ethics committee approval and informed consent was taken to utilize patient's data for analysis.

Results

We have evaluated several available parameters in bariatric patients and our evaluation is as under:

1. Prevalence of SDB

Analysis was performed using questionnaire, administered pre-operatively by authors as part of sleep interview. Both ESS and Berlin questionnaire were utilized for analysis of prevalence. A validated Hindi version of both the questionnaire was used in English illiterate subjects. The prevalence of SDB in the study subject was estimated to be 91%. Polysomnography (PSG)



Graph 2: Age & Sex distribution amongst patients of SDB

analysis of the same study population done subsequent to sleep interview revealed an incidence of 86%.

2. Demographic data

Age and gender

58.25% of our study subjects were of age more than 40 yrs. and 65% of all subjects were males. Females were predominantly found in 16-40 yrs. age group. Over all prevalence of females having SDB was 35%.

In the pediatric age group, predominantly male children with hypothyroidism Down's syndrome had presented to us.

A male: female ratio of 1.85:1 was observed in our study subjects.

Socio-economic status

Predominantly the patients presenting for bariatric surgery for SDB belonged to upper middle class income group (45%), followed by upper income group (29%).

The literacy level of the study subjects was higher than the national average. We recorded 55% to be graduates and 20% to be post graduates.

The lifestyle of these patients was predominantly sedentary (66%)

Occupation

Males

Patients were predominantly businessmen dealing in grains, clothes, and industrialists (owners). A significant population was of white collared employees who were in technical jobs like mechanical engineering and IT sector. 5% of the males were aspiring politicians and 5% were retired government employees. One percent of the male population were students.

Females

They presented a varied picture with sharp contrast between urban and sub-urban population. An equal proportion from both amounting to nearly 29% presented with the sole purpose of better matrimonial prospects.

Urban females predominantly were either college going students or housewife with marriage duration of more than 10 yrs. and completed family. While rural housewives were usually post menopausal females with predominant complaints of osteoarthritis.

Dietary habits and addiction

42.25% of the total study subjects were non vegetarian (consuming non vegetarian diet on more than 4 days a week and compulsorily on weekends). 1.32:1 proportion of males was vegetarians and 1.45:1 females were vegetarians. Predominant non vegetarian diet included chicken. In the age group of 18-40 yrs. high consumption of processed non vegetarian diet was at fast food outlets.

Vegetarians were predominantly of the rural setting, reporting high consumption of dairy products and sweets.

Addiction history revealed predominantly (29.75%) of both alcohol and tobacco consumption daily. Predominantly pure tobacco users consumed tobacco in the form of chewable tobacco with pan masala.

Alcoholics reported extremely high consumption of beer (75% of all alcoholics).

Table I: Depicting the types of SDB

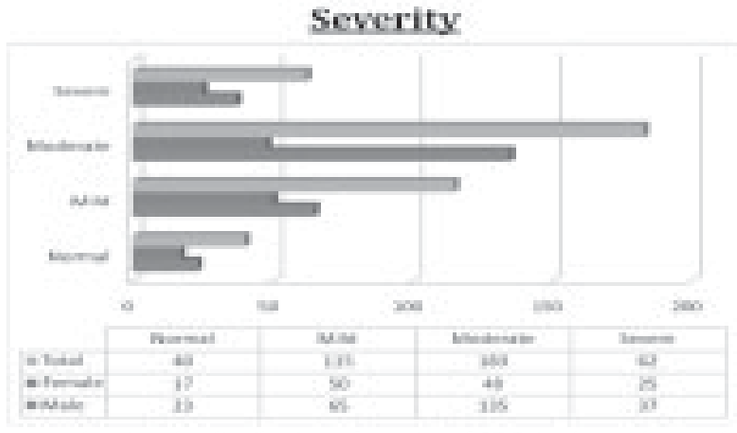
Types of SDB

OSAHS	50%
Insomnia	22%
Obesity hypoventilation syndrome	8%
REM related sleep disorders	20%
Nocturnal enuresis	
Overlap syndrome	
Fragmented sleep pattern	
Delayed onset of normal sleep	
Excessive sleepiness with no apparent cause	

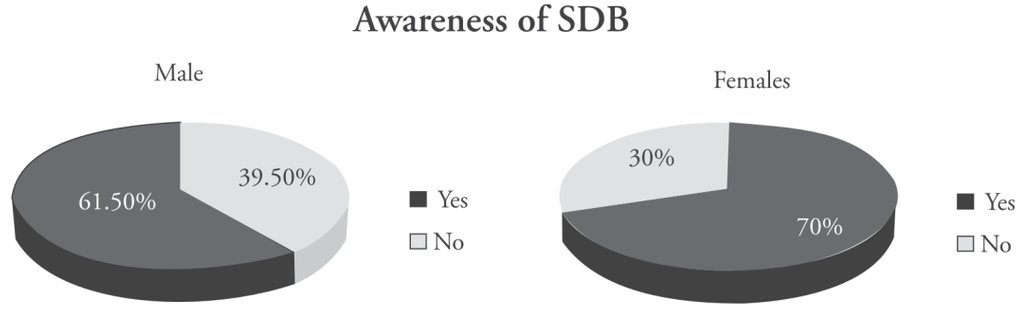
3) Sleep disordered breathing analysis

PSG analysis performed pre operatively was suggestive of 50% of SDB of OSAHS variety. 22% of the patients had insomnia with an extremely delayed onset and 8% presented with obesity hypoventilation with Type 2 respiratory failure.

Moderate OSAHS was seen in 45.75% of study subjects and was the most common type of SDB with male preponderance (M: F=2.85:1). Female SDB patients were usually of mild OSAHS. Nearly 46% of our study subjects with OSAHS were observed to have critical desaturation (<70% SpO2) at multiple times on PSG study and only 32% were found to have no significant desaturation.



Graph 3: Bar diagram showing the distribution of severity of SDB in the study population



4. Awareness and treatment analysis

In our study subjects female were highly aware of SDB as compared to their male counterparts.

But it did not translate into their taking any treatment for the same. Causes enumerated by them were social stigma, family pressure and financial restraints.

Common symptoms associated with SDB

These were the most common reported symptoms for which treatment was sought.

Treatment analysis

Nearly 45% of the study subjects were on medical managements of complications associated with SDB. Of the total patients 5% were utilizing NIV as a treatment option for SDB (BiPAP> CPAP). Nearly 35% of the treatment naive patients opted for laser assisted bariatric surgery (LABS) as the first line of treatment for SDB.

Symptoms	Total
Lack of concentration	90%
Morning irritability	50%
Grogginess	60%
Snoring	95%
Haziness	30%

10% of the total study subject group were aware or consulted respiratory physicians or sleep specialists for their problems and were on treatment, but decided to undergo surgery for cure of snoring.

Snoring was reported to be the most frequent reason that patients decided to undergo surgery for the

correction of SDB. Follow up of such patients over a period of 6 months to 1 year is underway.

Co morbid conditions

Obese patients presenting for bariatric surgery with SDB reported:

Co-existing co morbid conditions

System	Respiratory	Gastro-intestinal	Cardio Vascular	Endo crine	Others
	Bronchial Asthma (70%)	Acid-peptic disease (53%)	Hyper tension (55%)	T2DM (62%)	Osteo arthritis (40%)
	COPD	GERD	Valvular Heart Disease	**Hypo thyroidsm (58%)**	Muscle dystro phies
	Tuber culosis	IBS	PAH	Hyper thyroidism	CVA
	Allergic Rhinitis	Liver Cirrhosis	Cor-pulm onale	Dyslip idema	Anxiety
			Hemorrh oids	CAD	
			Gall Stones		
			Renal Stones		
			Hernia		

Discussion

Our study was conceived with the intention of pin pointing the KAP gap of the society. Our study subject group is already a pre-disposed group to SDB due to its higher BMI. But our study becomes relevant since we have considered obesity to be a common factor amongst all study subjects and therefore tried to minimize the bias created by this variable. In Central India/ India as a whole, a detailed epidemiological, demographical and treatment analysis of morbidly obese patients presenting for bariatric surgery was lacking and therefore, has become our interest of study.

Prevalence

We observed a very high incidence of SDB since we have studied obese patients who have a high risk of SDB due to peripheral causes like increased fat deposition in upper airway, abdominal obesity pushing up the diaphragm and central causes due to resetting of the central chemoreceptors. There was a significant difference between obese and non obese population ($p<.001$), hence we can conclude that obesity is a strong risk factor for SDB.

Demographic data

Our study found that obese middle aged males were most commonly affected with SDB. A previous study has shown that prevalence of SDB in the Indian population is three-fold higher in men as compared to women and it increases with age[5].

Author	Study Group	Analyzed By	Prevalence
Dosi et al	Obese Indian	SI	91%
Dosi et al	Obese Indian	PSG	86%
Suri et al[1]	School Children	SI	12.7%
Udwadia etal[2]	Middle aged urban Indian	PSG+SI	19.5%
Gupta etal[3]	Obese Indian	PSG	86.6%
Young etal[4]	Middle aged	PSG	15.5%

They usually belonged to the upper middle class and were the self employed businessmen, with a sedentary life style. Predominantly their dietary habit was vegetarian with a high amount of dairy product consumption. This particular age group was most commonly observed in our study population since they mostly did not have any significant amount of physical activity and belonged to an affluent class of society. A higher presentation could be interpreted either due to their life style or due the increased awareness about health, more frequent doctor visits and frequent use of mass-communication media.

Medically identifiable causes include hyperglycemia, hyperlipidemias, lack of stimulant action of progesterone in male populations and less burn out of accumulated calories with lack of motivation. Their addictions included daily consumption of liquor in significant quantities (>360 ml) on most week days with an average of 10-12 pack yrs of cigarette smoking. Alcoholism contribute to abdominal obesity and fat accumulation around the pharynx and smoking predisposes them to co existent respiratory problems adding to the severity of SDB. A very significant number of these people were late night

sleepers and late risers which could be attributable to their deranged homeostatic function and subsequent loss of bio rhythm. Even the younger population of our study reported altered sleep habits since adolescence causing altered eating habits resulting in obesity and obesity related problems.

Types and severity of SDB

Co-morbid conditions and treatment analysis

A very high prevalence of cardio-vascular, respiratory and endocrine disorders was noted in our obese patients with SDB, which have been commonly labeled as Syndrome Z and Syndrome X, collectively. This could be both due to mechanical limitation imposed by obesity as well as the hormonal effects of adipose tissue by leptin and adiponectin hormone. Cardiovascular diseases were also attributed to be due to diet related hyperlipidemia and poor exercise capacity. Respiratory manifestations usually revealed a mixed pattern of disease mostly due to bronchial asthma per se and restriction imposed by a raised diaphragm due to abdominal obesity.

Patients with SDB had a higher prevalence of diabetes. A study showed that prevalence of diabetes in patients with an apnea–hypopnea index (AHI) of 15 or more had total of 14.7% of subjects with a diagnosis of diabetes compared with 2.8% of subjects with an AHI of less than five[7].

Comparative symptoms

Symptoms comparison

In our study the most common symptom was loud snoring (95%). Where as in a study conducted by Johnson et al[6] was found to be 20%.

Treatment

Awareness as well as the treatment options though well acknowledged were poorly used by our study subjects. BiPAP tolerance was noted to be extremely poor with only 5% of all patients acquiring a NIV for use and hardly 10% of them utilizing them in prescribed manner. Bariatric surgery being a onetime affair, offering guaranteed weight loss was opted by most of the patients as the procedure of choice, due to its luxurious nature and the absolute loss in weight which is incomparable to any other procedure, independent of physical exertion.

The findings in our study of the Indian subset of population is similar to those of other studies.

Conclusion

Our study was performed in the first medical college of India offering a full fledged bariatric program under one roof involving super specialty care to our patients. Our analysis of these obese patients who have opted for bariatric surgery as their treatment of choice for their obesity and obesity related SDB. It is the first study of its kind to be performed on this scale in Central India with 400 subjects of an average BMI >30. While confirming established norms of SDB we were also able to conclude data specific for our study populations, which are:

- Out of all patients 90% had SD
- Predilection towards male with a ratio of almost 1.85:1
- Predominant age group above 40 yrs
- OSAHS most common type of SDB
- Most common type of addiction observed was mixed type
- Most common disease was bronchial asthma and most common affected system was CVS
- Although maximum patients were aware of their SDB but majority of them still did not seek any consultation nor treatment

Limitations

Our study was limited to one single center, for duration of one and half years and to establish an epidemiological data, larger study population and longer duration is ideal. We performed PSG analysis using a level II machine, while a more detailed overnight PSG study would have predicted SDB more better. No extra funding was accepted from any other source.

Acknowledgment

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