Research Article

Role of sleep duration and quality with central obesity in Indians

Sadanand C D, Thimmareddy S R, Ravishankar S N, Madhuvan H S

Department of General Medicine, Akash Institute of Medical Science and Research Center, Bengaluru, Karnataka, India

Correspondence to: Thimmareddy S R, E-mail: drsrtmothkur@gmail.com

Received: May 25, 2019; **Accepted:** June 22, 2019

ABSTRACT

Background: With increasing evidence of association between metabolic diseases with sleep disorders, we tried to look for association between the sleep and various anthropometric parameters of obesity. **Objectives:** The objectives of this study were to correlate quality and duration of sleep with various grades of obesity. **Materials and Methods:** About 88 diabesity subjects were included in the study after fulfilling the inclusion and exclusion criterion. There various anthropometric data were collected and sleep quality was assessed by Pittsburgh Sleep Quality Index (PSQI) questionnaire. Descriptive and inferential statistical method was done using SPSS 18.0 for data analysis. Pearson correlation, Chi-square, and Fisher's exact tests were used. **Results:** The mean PSQI total value for men was 4.45 ± 3.45, and for female, it was 5.85 ± 3.78. The mean PSQI value of rural population was 4.35 ± 3.23 and that of urban population 5.05 ± 3.71. There was increase in the sleep score as grades of obesity increased, but this increase was statistically insignificant ($P = 0.265$). Pearson correlation coefficient was obtained for anthropometric values and PSQI total. The correlation coefficient r value for was 0.135 for age, 0.080 for waist circumference, 0.081 for hip, −0.039 for waist-hip ratio, and 0.067 for body mass index. **Conclusion:** The study results showed no correlation between sleep quality as assessed by PSQI and various anthropometric parameters.

KEY WORDS: Sleep Quality; Pittsburgh Sleep Quality Index; Obesity; Anthropometric Parameters

INTRODUCTION

Endocrine function has circadian rhythm. Disturbed sleep leads to insulin resistance which, in turn, leads to metabolic syndrome.[1] Obesity, Type 2 diabetes mellitus, hypertension, and cardiovascular diseases (CVD) are few metabolic syndromes associated with sleep debt. Both duration and quality of sleep are important for metabolic disorders. Obesity is now a major public health issue with high mortality from CVD, cancer, and all-cause mortality.[2] In India, the prevalence of obesity is increasing. A recent study conducted to know prevalence of obesity in four states of India and extrapolated to whole country. The prevalence of general obesity was 135 million, abdomen obesity was 153 million, and combined obesity is 107 million.[3] Similarly, there is a rise in the prevalence of sleep-related disorders. This is due to urbanization, shift works, increased noise pollution from increased late-night traffic, and air pollution due to various causes. Since the prevalence of both diabesity and sleep-related disorders is increasing, we tried to see if there is any association or correlation between the two.

Pittsburgh Sleep Quality Index (PSQI) is a validated sleep quality index with high sensitivity and specificity. It is a new sleep quality index which can be used for research and psychiatric evaluation.[4]

The present study was carried out with aims and objectives to correlate the duration of sleep with various grades of obesity.

Access this article online	
Website: http://www.ijmsph.com	Quick Response code
DOI: 10.5455/ijmsph.2019.0617422062019	

MATERIALS AND METHODS

Diabesity patients above the age of 20 years were selected for the study. About 88 subjects were included in the study. Patients

who had incomplete response to questionnaires, recently diagnosed diabetes patients, patients who claim they sleep for more than 12 h, and patients with chronic pain were excluded from the study. Patients were grouped into four groups based on body mass index (BMI). Patients with BMI between 18.5 and 22.9 kg/m^2 as normal, 23.0–24.9 as Grade I obesity, 25–29.9 as Grade II obesity, and those with BMI >30 as morbid obesity.

Methodology

The study involved a 30–45 min interview. Written informed consent was taken. During the interview, anthropometric values such as waist circumference (WC) at the level of umbilicus, hip circumference at the level of highest paint of hip, height in centimeters, and weight in kilograms were taken. The presence of major complications of diabetes (neuropathy, retinopathy, nephropathy, coronary artery disease, and peripheral vascular disease) was also assessed. The interview included the PSQI, 26 a validated 19-item questionnaire that produces a global sleep quality score that ranges from 0 to 21, derived from 7 component scores. A global score >5 distinguishes poor sleepers from good sleepers. The question "how often have you had trouble sleeping because you had pain?" Identified patients with sleep disturbed by pain as those who responded "3 or more times per week." We exclude these individuals in our analyses of the association between sleep and glycemic control because chronic pain is a likely confounder.

Ethical Committee Clearance was taken. About 88 subjects were included in the study.

Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on mean ± standard deviation (minimum-maximum) and results on categorical measurements are presented in number (%). Significance is assessed at 5% level of significance.

The following assumptions on data are made, assumptions: (1) Dependent variables should be normally distributed and (2) samples drawn from the population should be random, cases of the samples should be independent.

Analysis of variance has been used to find the significance of the study parameters between three or more groups of patients, Student's *t*-test (two tailed, independent) has been used to find the significance of the study parameters on continuous scale between two groups (intergroup analysis) on metric parameters.

Chi-square/Fisher's exact test has been used to find the significance of the study parameters on categorical scale between two or more groups, non-parametric setting for qualitative data analysis. Fisher's exact test is used when cell samples are very small.

Pearson correlation between the study variables is performed to find the degree of relationship, Pearson correlation coefficient ranging between −1 and 1, −1 being the perfect negative correlation, 0 is the no correlation, and 1 means perfect positive correlation.

RESULTS

About 88 diabesity patients were included in the study. There mean age was 49.35 ± 10.59. Our study included 68.25% (60) of men and 31.8% (28) of women. The mean PSQI total value for men was 4.45 ± 3.45, and for female, it was 5.85 ± 3.78. Female had poor sleep quality than men. About 77.3% (68) of diabesity patient were from urban area and rest 22.7% (20) were from rural. Predominantly, the study population was urban male. The mean PSQI value of rural population was 4.35 ± 3.23 and that of urban population 5.05 ± 3.71. Urban population were poor sleepers compared to rural. Mean WC of the study population was 98.14 ± 10.13 cm and waist-hip ratio (WHR) was 0.97 ± 0.095. The mean BMI of the study group was 26.72 ± 4.97 kg/m^2. After excluding patient with chronic pain, the mean of PSQI total was 4.90 ± 3.604.

Patients were grouped according to grades of obesity based on BMI. There were 18.2% (n = 16) with normal BMI, 17% (n = 15) with Grade I obesity, 44.35 (n = 39) with Grade II obesity, and 20.5% (n = 18) with morbid obesity. As can be shown from Table 1, there was a significant increase in the WC ($P < 0.001$) and hip circumference ($P < 0.001$) but insignificant increase in the WHR ($P < 0.235$) across various grades of obesity.

We compared the quality of sleep with PSQI total score across various groups of obesity. There was increase in the sleep score as grades of obesity increased, but this increase was statistically insignificant as can be shown from Table 2 ($P = 0.265$).

Pearson correlation coefficient was obtained for anthropometric values and PSQI total Table 3. r value was 0.135 for age, 0.080 for WC, 0.081 for hip, −0.039 for WHR, and 0.067 for BMI, indicating that there was negligible or low correlation between various anthropometric measures and sleep quality as measured by PSQI total. However, these correlation r values were statistically insignificant.

Then, the subjects were grouped as poor sleepers with PSQI total >5 and good sleepers with PSQI total ≤5 and looked whether there is any significant change in obesity anthropometric values Table 4. As we see from Table 4, there was no significant difference in WC, WHR, or BMI between good sleeper and poor sleepers.

DISCUSSION

Diabesity is increasing in India at alarming level. There is also rapid urbanization which also brings along with it

Table 1: Comparison of the study variables in relation to BMI of patients studied

Variables	BMI (kg/m^2)				Total	*P* value
	Normal	Grade I	Grade II	Grade III		
Age in years	47.69±9.31	51.40±12.01	47.62±10.49	52.89±10.31	49.35±10.59	0.263
WC	91.56±7.62	92.20±5.99	98.06±8.25	109.11±9.68	98.14±10.14	<0.001**
Hip circumference	93.94±5.30	101.53±20.39	99.94±6.02	110.28±10.1	101.23±11.62	<0.001**
WHR	0.98±0.07	0.93±0.13	0.98±0.09	0.99±0.08	0.98±0.10	0.235

WC: Waist circumference, WHR: Waist-hip ratio, BMI: Body mass index, **Significant value is <0.001

Table 2: Comparison of clinical variables according to BMI of patients studied

PSQI total	BMI (kg/m^2)				Total	*P* value
	Normal	Grade I	Grade II	Grade III		
	3.94±3.15	6.00±3.80	4.49±3.63	5.72±3.64	4.90±3.60	0.265

BMI: Body mass index, PSQI: Pittsburgh Sleep Quality Index

Table 3: Pearson correlation

PSQI versus	*r* value	*P* value
PSQI total versus age in years	0.135	0.211
PSQI total versus WC	0.080	0.460
PSQI total versus HIP circumference	0.081	0.452
PSQI total versus WHR	−0.039	0.719
PSQI total versus BMI (kg/m^2)	0.067	0.533

WC: Waist circumference, WHR: Waist-hip ratio, BMI: Body mass index, PSQI: Pittsburgh sleep quality index

Table 4: Comparison of clinical variables according to PSQI total score levels of patients studied

Variables	PSQI total		Total	*P* value
	≤5	>5		
WC	97.68±9.44	98.81±11.18	98.14±10.14	0.612
WHR	0.98±0.09	0.97±0.10	0.98±0.10	0.842
BMI (kg/m^2)	26.52±3.78	27.01±6.38	26.72±4.98	0.647

WC: Waist circumference, WHR: Waist-hip ratio, BMI: Body mass index, PSQI: Pittsburgh sleep quality index

increase in air pollution, sound pollution, and water pollution. All this with increase in industries with day and night shifts, frequent change in job, and international travel for job bring about change in sleeping pattern and quality and adequacy of sleep. This leads stress and release of inflammatory markers which, in turn, lead to altered homeostasis. This increase inflammatory burden is the hallmark of metabolic syndrome. Diabesity as a part of metabolic syndrome has high incidence.

In the present study, we tried to correlate sleep quality as a one of the cause for increase in the incidence of diabesity. Men had high poor sleep score compared to women and urban population were poor sleepers than rural population in our study. There was no significant correlation between various anthropometric values such as WC, WHR, or BMI grades with quality of sleep as assessed by PSQI. Compared to subjects with normal BMI, subjects with obesity had a higher global PSQI score. They were poor sleepers. However, this increase in the global PSQI score was statistically insignificant. The study also compared whether good sleeper with PSQI score ≤5 had a lesser anthropometric parameter of obesity as compared to poor sleeper with PSQI score >5. However, there was no significant change. When we correlated WC with the global PSQI score (*r* value =0.080) was suggestive of negligible association, whereas WHR showed negative correlation ($r = -0.039$).

In a study done in China with large sample size of 2800, there was a significant association between obesity as measured by BMI and poor sleep quality.[5] This may be due to the large sample size in the above study. Hence, we looked at other studies which were done with smaller sample size. In one more study with smaller sample size of 100, where they looked for association between sleep and sleep quality. The study was done on medical students. There was no significant difference in the anthropometric parameters of poor sleepers and good sleepers.[6]

We feel that small sample size was the major limitation of the study. A detailed occupation history with day and night shifts and type of work could have helped in better understanding the cause and correlation.

CONCLUSION

In the present study, we find no correlation between the various anthropometric measures of obesity and sleep quality among obese diabetes. However, small sample size could be a major limitation of the study.

ACKNOWLEDGMENT

The author would like to thank Dr. K. P. Suresh, Scientist (Biostatistics), National Institute of Veterinary Epidemiology and Disease Informatics, Bengaluru-560 024.

REFERENCES

1. Spiegel K, Leproult R, Van Cauter E. Impact of sleep debt on metabolic and endocrine function. Lancet 1999;354:1435-9.
2. Cappuccio FP, D'Elia L, Strazzullo P, Miller MA. Sleep duration and all-cause mortality: A systematic review and meta-analysis of prospective studies. Sleep 2010;33:585-92.
3. Pradeepa R, Anjana RM, Joshi SR, Bhansali A, Deepa M, Joshi PP, *et al.* Prevalence of generalized and abdominal obesity in urban and rural India the ICMR-INDIAB study (Phase-I) [ICMR- NDIAB-3]. Indian J Med Res 2015;142:139-50.
4. Buysse DJ, Reynolds CF 3rd, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh sleep quality index: A new instrument for psychiatric practice and research. Psychiatry Res 1989;28:193-213.
5. Hung HC, Yang YC, Ou HY, Wu JS, Lu FH, Chang CJ, *et al.* The association between self-reported sleep quality and overweight in a Chinese population. Obesity (Silver Spring) 2013;21:486-92.
6. Babu R, Bahuleyan B. Correlation of sleep quality with anthropometric parameters in young healthy individuals. Int J Res Med Sci 2018;6:613-7.

How to cite this article: Sadanand CD, Thimmareddy SR, Ravishankar SN, Madhuvan HS. Role of sleep duration and quality with central obesity in Indians. Int J Med Sci Public Health 2019;8(8):693-696.

Source of Support: Nil, **Conflict of Interest:** None declared.