Research Article

A Study to Assess the Relationship of Anthropometric Indices to Risk of Obstructive Sleep Apnea among Patients Attending Pulmonology Outpatient Department at GKNM Hospital, Coimbatore

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Abstract

Aim: The study aimed to assess the relationship of anthropometric indices to risk of obstructive sleep apnea (OSA) among patients attending pulmonology outpatient department (OPD) at GKNM Hospital, Coimbatore.

Materials and Methods: The research was conducted using a descriptive research design and the sample size was set at one hundred people who were chosen using a non-probability convenient sampling technique. The participants' demographic information was collected and the Modified Berlin Questionnaire was used to determine the participants' potential for developing OSA. An anthropometric measurement system that is standardized was utilized for the purpose of determining anthropometric indices.

Results: Descriptive and inferential statistics were used to analyze the data. The relationship between anthropometric indices and risk of OSA was calculated using single mean t-test method. The study findings indicate that there is a significant relationship between the anthropometric indices such as body mass index (BMI), body fat percentage (BFP), neck circumference (NC) and waist-hip ratio (WHR), and risk of OSA.

Conclusion: The results of the study demonstrated that there is a relationship between the danger range of anthropometric indices, including BMI, BFP, NC, and WHR, and the risk of OSA in patients who were attending the pulmonology OPD. Therefore, patients who are at risk of developing OSA can assist prevent the condition from developing early on if they are recognized at an early stage and basic preventative measures are performed.

Keywords: Anthropometric indices, obstructive sleep apnea, pulmonology outpatient department.

Introduction

Sleep and rest are important concerns in health and illness. Sleepiness has been shown to influence health status, including a person's perceived levels of energy and fatigue. People use phrases like "feeling well rested" and "energetic" to describe good sleep and good health. Sleep is naturally occurring altered state of consciousness characterized by decreases in awareness and responsiveness to stimuli.[1]

Sleep is recognized as an important factor of public health. Sleep insufficiency is linked to hazardous outcomes such as industrial disasters, motor vehicle crashes, and medical and other occupational errors. Having difficulty in performing daily tasks because of sleepiness, unintentional falling asleep, and nodding off while driving vehicles, may contribute to these hazardous outcomes. Persons experiencing sleep insufficiency are at risk of developing chronic diseases such as diabetes, hypertension, depression, and obesity and cancer which in

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turn lead to increased mortality rates, and reduce quality of life and productivity. Work schedules and round-the-clock access to technology are the major societal factors responsible for sleep insufficiency. However, sleep disorders such as obstructive sleep apnea (OSA) and insomnia also play an important role. About 50–70 million adults in the US have sleep or wakefulness disorder. Notably snoring is one of the major indicators of OSA.[2]

Several changes occur with increasing age that can place a person at risk for developing sleep disturbance, increased prevalence of medical conditions, age-related changes in various circadian rhythms, increased medication use, and environmental and lifestyle changes. Nearly half of older adults report difficulty in initiating and maintaining sleep. Sleep disorders commonly occur among all age groups. Some of the primary sleep disorders that are more prevalent among older adults are insomnia, periodic limb movements in sleep, sleep-disordered breathing, restless leg syndrome, rapid eye movement sleep behavior disorder, and circadian rhythm disturbances.[3] At present, about 150 million people are suffering from sleep disorders. A multi-national and large-scale study of sleep problems was conducted by the researchers at the University of Warwick Medical School among eight countries in Africa and Asia with the objective of assessing the frequency of sleep-related problems in those countries where issues related to sleep have been under-examined. The results revealed an overall rate of nearly 17% of the population in these developing countries suffering with sleep problems. The lowest rates of sleep problems were reported in India and Indonesia. In India, 6.5% of women and 4.3% of men reported problems with sleep.[4]

"Apnea" is a Greek word which means "without breath." Sleep apnea refers to involuntary cessation of breathing that happens while a person is asleep. Sleep apneas are of three types: Obstructive, central, and mixed. Of the three, the most common is OSA, which is called OSA for short. Even though the root cause of each type is different, in all the three, people with untreated sleep apnea repeatedly stop breathing while sleeping, sometimes even hundreds of times during the night. Untreated sleep apnea can cause serious and life-threatening consequences such as hypertension, diabetes, heart diseases, stroke, automobile accidents caused by falling asleep, depression, and other ailments.[5]

OSA is also known as OSA hypopnea syndrome (OSAHS). It is a condition characterized by partial or complete obstruction of the upper airway during sleep. The obstruction may last from 15 to 90 s. During apneic period, the patient can experience severe hypoxemia and hypercapnia. These changes are the ventilatory stimulants that awaken the patient. The patient has a generalized startle response, snorts, and gasps, which causes the tongue and soft palate to move forward and the airway to open. Repeated apnea and arousal cycles occur, even as many as 200–400 times during 6–8 h of sleep.[6]

Undiagnosed OSA can lead to adverse effects such as increased risk of diabetes mellitus, high blood pressure, brain strokes, heart attacks, and motor vehicle accidents. In India, there are over 120 million adults living with OSA. Children are also at higher risk of OSA. A majority of OSA cases are undiagnosed and remain untreated.[7] The prevalence of OSA in India is about 24% of men (mostly over 40 years) and 9% of women.[8]

The American College of Physicians gave new guidelines for treating OSA which emphasizes on lifestyle modifications, especially weight loss. Their first recommendation is about weight reduction for overweight and obese people. The existence of link between overweight and OSA is well-established. Obese people have extra tissues behind their throat. While they sleep these tissues can fall back and block the flow of air into the lungs. Even 10% of reduction in body weight can cause a big effect on the symptoms of sleep apnea. In some persons, a significant amount of weight loss can even cure OSA. (Stephanie Watson, 2013).[9]

The application of continuous positive airway pressure (CPAP) by means of a facemask covering the nose is the treatment of choice. The CPAP device provides room air under increased pressure, essentially providing a pressure splint to keep the upper airway open. Bi-level positive airway pressure (BiPAP) operates by the same principle but uses lower pressure during expiration.[10]

At present, the first line of treatment for OSA is medical management. The treatment for OSA include: (1) General measures: Avoidance of alcohol, sedatives, and hypnotics; weight loss; and other measures including oxygen therapy and nasal dilators. (2) Specific measures: Position therapy, positive airway pressure, and oral appliances.[11]

Materials and Methods

The data were collected for 4 weeks. The samples selected were given self-introduction and oral consent was obtained. The participants were assured about confidentiality of the data collected and it will be used only for research purpose. Demographic data such as age, sex, education, occupation, religion, marital status, type of family, and monthly income of family and related risk factors of OSA were collected from the participants. Each participant was assessed for the risk of OSA using the Modified Berlin Questionnaire. Anthropometric indices such as body mass index (BMI), body fat percentage (BFP), neck circumference (NC), waist circumference (WC), hip circumference (HC), waist-hip ratio (WHR), and waist-to-height ratio (WHtR) of each participant were measured using anthropometric indices measurement scale. In this study, quantitative research approach was selected for assessing the relationship of anthropometric indices to risk of OSA. The research design used for this study was "Descriptive Research Design". Non-probability convenient sampling technique was adopted for the study.

Population

The population of the study comprised all patients who were attending Pulmonology Outpatient Department (OPD) and G.K.N.M Hospital, Coimbatore, was the setting of this study.

Sample and sample size

One hundred patients attending the Pulmonology OPD were selected as samples.

Sampling technique

Non-probability convenient sampling technique was adopted for the study.

Sampling criteria

Patients who were willing to participate in the study and who were at risk for obstructive sleep apnea were included in this study. Patients who were sick and unable to undergo measurement procedures, who were not cooperative, and who were below 30 years of age were excluded from the study.

Data analysis

Descriptive and inferential statistics were used to analyze the data. Frequency and percentage distribution were used to assess the demographic variables. Frequency, percentage, mean, and standard deviation were used to assess the anthropometric indices. t-test was used to assess the relationship between anthropometric indices and the risk of OSA. Chi-square test was used to assess the association between selected demographic variables and anthropometric indices.

Results

Table 1 reveals that majority 29 (29%) of the subjects belonged to the age group of 60–69 years, 58 (58%) of the subjects were males and 42 (42%) were females, majority of the subjects, that is, 61% had school education, 35 (35%) were unemployed, majority of subjects, that is, 89 (89%) belonged to Hindu religion, majority of subjects, that is, 80 (80%) were married, 72 (72%) of the subjects lived in nuclear family, 34 (34%) of subjects had an income of more than Rs. 30,000/month and only 6 (6%) of subjects belonged to low income of less than Rs.10,000/month, and among 100 subjects, 45 (45%) of subjects were hypertensive and 39% were diabetic.

Table 2 shows that out of 100 subjects, 36 (36%) were at high risk for OSA and 64 (64%) were at low risk for OSA.

Table 3 shows that out of 36 high-risk OSA patients, 31 (86.11%) patient's BFP was within the risk range and 5 (13.89%) patient's BFP was normal. All the seven anthropometric indices were in the risk ranges among 50% and above of high-risk OSA patients. This denotes a direct risk relationship between the anthropometric indices measured and OSA among high-risk OSA patients.

Table 4 shows that out of 64 low-risk OSA patients, 43 (67.19%) patient's BFP was within the risk range and 21 (32.81%) patient's BFP was normal. BFP, WHR, and WHtR are within risk range for 50% and above of low-risk OSA patients. This denotes a direct risk relationship between BFP, WHR and WHtR, and low-risk OSA.

Table 5 shows that the relationship between anthropometric indices and risk of OSA was calculated using single mean t-test

Table 1: Distribution of demographic variables of patients with OSA risk (n=100)

S. No.	Demographic variables	Frequency (f)	Percentage
1	Age (in years)		
	a) <40	8	8
	b) 40–49	12	12
	c) 50–59	22	22
	d) 60–69	29	29
	e) 70–79	23	23
	f) 80 and above	6	6
2	Sex		
	a) Male	58	58
	b) Female	42	42
3	Education		
	a) Illiterate	17	17
	b) School level	61	61
	c) Undergraduate	22	22
	d) Postgraduate	0	0
4	Occupation		
	a) Unemployed	35	35
	b) Self-employed	28	28
	c) Government employee	19	19
	d) Private employee	18	18
5	Religion		
	a) Hindu	89	89
	b) Christian	8	8
	c) Muslim	3	3
	d) Others	0	0
6	Marital status		
	a) Single	1	1
	b) Married	80	80
	Widow/widower	19	19
7	Type of family		
	a) Nuclear	72	72
	b) Joint	28	28
8	Monthly Income		
	a) Rs. ≤10,000	6	6
	b) Rs. 10,000 – 20,000	30	30
	c) Rs. 20,001 – 30,000	30	30
	d) Rs. ?30,000	34	34
9.	Related risk factors		
	a) Family history of OSA		
	Present	2	2
	Absent	98	98
	b) Hypertension		
	Present	45	45
	Absent	55	55
	c) Diabetes mellitus		
	Present	39	39
	Absent	61	61
	d) Alcoholism		
	Present	13	13
	Absent	87	87
	e) Smoking		
	Present	23	23
	Absent	77	77
	f) Sedative/tranquilizer use		
	Present	7	7
	Absent	93	93
	g) Chronic nasal congestion		
	Present	30	30
	Absent	70	70

(Contd...)

Table 1: *(Continued)*

S. No.	Demographic variables	Frequency (f)	Percentage
	h) Post menopausal women		
	Present	30	30
	Absent	70	70
	i) Childhood asthma		
	Present	6	6
	Absent	94	94

OSA: Obstructive sleep apnea

Table 2: Distribution of patients according to OSA risk (*n*=100)

S. No.	Risk of OSA	F	%
1	High risk	36	36
2	Low risk	64	64
	Total	100	100

OSA: Obstructive sleep apnea

Table 3: Distribution of patients according to OSA high risk and anthropometric indices value (*n*=36)

Anthropometric indices	Risk range		Normal range		Total	
	F	%	F	%	F	%
BMI	27	75	9	25	36	100
BFP	31	86.11	5	13.89		
NC	22	61.11	14	38.89		
WC	28	77.78	8	22.22		
HC	22	61.11	14	38.89		
WHR	24	66.67	12	33.33		
WHtR	32	88.89	4	11.11		

OSA: Obstructive sleep apnea, BMI: Body mass index, BFP: Body fat percentage, NC: Neck circumference, WC: Waist circumference, HC: Hip circumference, WHR: Waist-to-hip ratio, WHtR: Waist-to-height ratio

Table 4: Distribution of patients according to OSA low risk and anthropometric indices value (*n*=64)

Anthropometric Indices	Risk range		Normal range		Total	
	F	%	F	%	F	%
BMI	24	37.5	40	62.5	64	100
BFP	43	67.19	21	32.81		
NC	17	26.56	47	73.44		
WC	27	42.19	37	57.81		
HC	19	29.69	45	70.31		
WHR	45	70.31	19	29.69		
WHtR	39	60.94	25	39.06		

OSA: Obstructive sleep apnea, BMI: Body mass index, BFP: Body fat percentage, NC: Neck circumference, WC: Waist circumference, HC: Hip circumference, WHR: Waist-to-hip ratio, WHtR: Waist-to-height ratio

method. There is a significant relationship between BMI, BFP, NC, and WHR and risk of OSA.

Discussion

OSA is a disabling condition characterized by snoring, excessive daytime sleepiness, and repeated events of airway obstruction and hypoxemia during sleep which may lead to adverse health outcome. A study was conducted in Indian setting to test the usefulness of Berlin Questionnaire in the identification and risk grouping of OSA on 122 subjects, who

Table 5: Relation between anthropometric indices and risk of OSA (n=100)

Anthropometric Index	Mean	Standard Deviation	"t" value	df	Table Value
BMI	26.62	17.77	2.04*	99	1.98
BFP	33.56	22.8	2.00*		
NC	37.92	24.93	2.38*		
WC	92.10	61.41	1.97		
HC	104.39	68.14	0.64		
WHR	0.89	0.59	2.31*		
WHtR	57.01	37.84	1.85		

*Significant at 0.05 level. df: Degrees of freedom, OSA: Obstructive sleep apnea, BMI: Body mass index, BFP: Body fat percentage, NC: Neck circumference, WC: Waist circumference, HC: Hip circumference, WHR: Waist-to-hip ratio, WHtR: Waist-to-height ratio

underwent an overnight polysomnography study. Each patient received a Berlin questionnaire which contains questions regarding the occurrence of snoring, daytime sleepiness and fatigue, high blood pressure, and obesity. Patients with frequent persistent symptoms in two or three categories were considered as high risk for OSA. The study concluded that administration of Berlin questionnaire helps in identifying subjects who are likely to have OSA and can identify high-risk OSA subjects. This can avoid unnecessary polysomnography studies particularly in resource limited areas.[12] OSA is not easily recognized because the techniques required to identify the disorder such as a interviewing the patient to obtain sleep history or use of diagnostic equipment require considerable time and training. A standardized questionnaire called the Berlin Questionnaire, developed in 1996, consists of a sequence of questions regarding risk factors for OSA, including snoring, daytime sleepiness or fatigue, and hypertension or obesity. Berlin questionnaire was distributed to 1000 patients. According to the responses to questions, patients were grouped into high-risk and low-risk groups. Both the risk group patients were offered a portable monitoring of RDI during sleep. Subjects in the high risk for OSA group were considered to have RDI, meeting the criteria for OSAHS. The authors concluded that the Berlin questionnaire helps in recognizing subjects who meet or exceed RDI scores that are used in diagnosis and classification of OSAHS, even in the absence of physician encounter.[13] The findings of this study are in agreement with the above cited study which emphasizes the utility of Berlin Questionnaire, as a standardized tool for identifying patients at risk for OSA.

More than half of people with OSA are either obese or overweight, which is classified as a BMI of 25–29.9 or 30.0 or above. In adults, obesity is one of the strongest risk factors associated with OSA. A raise in one unit of BMI is associated with a 14% increase in risk of developing OSA. Men with a NC of above 17 inches and women with a NC of above 15 inches also have a notably increased risk of developing OSA.[14] Sahin *et al.* (2005) tested to investigate body fat composition for predicting the presence and severity of OSAHS. Body fat composition was compared with other predictors of OSAHS such as BMI, abdominal visceral fat, and NC. The results revealed a significant correlation

between BMI and body. Combination of BFP and body fat mass achieved a high level of sensitivity and specificity for diagnosis of OSAHS.[15] Subramanian *et al.* (2012) did a retrospective review of patients referred to a sleep laboratory for evaluation of OSA. The study aimed to assess the influence of anthropometric measurements and gender on the severity of OSA. Anthropometric measurements such as height, weight, NC, HC, and WC were measured; neck-to-height ratio and WHR were also calculated. Women had a higher BMI and WHR. Men had a higher neck-to-height ratio and thicker NC. Severity of OSA was associated with WHR in men. The authors concluded that WHR is a better predictor of severity of OSA. The present study findings are in agreement with the above study which emphasize the relationship between BMI, BFP, NC, and WHR and the risk of OSA.[16]

Conclusion

The findings of the study proved the existence of relationship between anthropometric indices and risk of OSA among patients attending pulmonology OPD. The researcher wants to communicate the message through this study that patients at risk of OSA if identified early, definitely primordial prevention much earlier prevent the occurrence of OSA.

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Conflicts of interest

None.

References

1. Craven RF, Hirnle CJ. Fundamentals of Nursing. 5th ed. Philadelphia, PA: Lippincott Williams and Wilkins Publications; 2006.
2. Available from: https://www.cdc.gov/features/dssleep [Last available 2023 May 01].
3. Roepke SK, Ancoli-Israel S. Sleep disorders in the elderly. Indian J Med Res 2010;131:302-10.
4. Grover M, Mookadam M, Armas D, Bozarth C, Castleberry T, Gannon M, *et al*. Identifying patients at risk for obstructive sleep apnea in a primary care practice. J Am Board Fam Med 2011;24:152-60.
5. Available from: https://www.sleepapnea.org/learn/sleep-apnea.html [Last available 2023 May 15].
6. Chintamani. Medical-surgical Nursing. 1st ed. New Delhi: Elsevier Publication; 2011.
7. Available from: https://articles.timesofindia.indiatimes.com/keyword/sleep-apnea/recent/2 [Last available 2022 Feb 17].
8. Available from: https://www.thehindu.com/sci-tech/health/making-sense-of-obstructive-sleepapnea/article4434569.ece [Last available 2021 Nov 16].
9. Watson S. Weight Loss, Breathing Devices Still Best for Treating Obstructive Sleep Apnea. Cambridge, Massachusetts: Harvard Health Publications; 2013. Available from: https://www.health.harvard.edu/blog/weight-loss-breathing-devices-stillbest-for-treating-obstructive-sleep-apnea-201310026713 [Last available 2013 Oct 02].
10. Black JM, Jacobs EM. Medical Surgical Nursing. 5th ed. Philadelphia, PA: W.B. Saunders Company; 2007.
11. Dunphy LM, Winland-Brown JE, Porter BO, Thomas DJ. Primary Care: The Art and Science of Advanced Practice Nursing. 2nd ed. Philadelphia, PA: F.A. Davis Company Publication; 2007.
12. Varghese B. Identification of risk for obstructive sleep apnea by Berlin Questionnaire. Res J Pharm Biol Chem Sci 2011;2:1035-40.
13. Sadovsky R. Questionnaire identifies risk for sleep apnea syndrome. Am Fam Physician 2000;61:1825-8.
14. Available from: https://www.webmd.com/sleep-disorders/sleep-apnea/obstructive-sleep-apnea-causes [Last available 2021 Nov 05].
15. Sahin A, Oğretmenoğlu O, Süslü AE, Yücel OT, Onerci TM. Body fat composition: A predictive factor for obstructive sleep apnea. Laryngoscope 2005;115:1493-8.
16. Subramanian S, Jayaraman G, Majid, H, Aguilar R, Surani S. Influence of gender and anthropometric measures on severity of obstructive sleep apnea. Sleep Breath 2012;16:1091-5.

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