Original Research Paper

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Medicine

TO DETERMINE CORRELATION OF OBSTRUCTIVE SLEEP APNEA HYPOPNEA SYNDROME WITH GLUCOSE INTOLERANCE AND DYSLIPIDEMIA IN GENERAL POPULATION

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ABSTRACT

Introduction : Obstructive sleep apnea and hypopnea syndrome is associated with many metabolic derangements .Better understanding of these relationships will help in improved management and prevention of cardiovascular complication of this disease.

Aim and Objectives: To determine correlation of Obstructive sleep apnea hypopnea syndrome with glucose intolerance, and dyslipidemia.

Material and methods: Observational study of 100 participants who were healthy attendants of patients presenting to Hamidia hospital from 1st December 2015 to 31st May 2017 and underwent full night in lab polysomnography and blood investigations .All participants were aged between 13 and 85 years. Pregnant ladies ,hypothyroid participants ,alcoholics and persons with enlarged tonsils and adenoids were excluded.

Results: Mean fasting blood sugar was 87.52 mg/dl,103.5 mg/dl,107.13 mg/dl,114.12 mg/dl and mean postprandial blood sugar was 125.28 mg/dl,142.43 mg/dl,152.03 mg/dl and 165.16 mg/dl in normal, mild, moderate and severe AHI groups respectively.17(>70%) persons with severe AHI had serum cholesterol level > 240 where as only 1 person with normal AHI had serum cholesterol > 240. The mean serum cholesterol in mild, moderate, severe AHI Group was 166.76 mg/dl, 225.09 mg/dl,233.91 mg/dl and 257.45 mg/dl respectively. A statistically significant relation between increasing severity of hypercholesterolemia and obstructive sleep apnea and hypopnea syndrome was found. Increasing AHI was significantly related with increasing serum triglyceride. The mean serum triglyceride in mild, moderate, severe AHI group was 147.96 mg/dl, 148.21 mg/dl, 157. 85 mg/dl. Out of 10 normal AHI male participants only 2 had serum HDL level less than 40 mg/dl and for severe AHI the value was 12 out of 15. The p value for males was 0.0015 and for females <0.5484 suggesting correlation of increasing AHI and decreasing serum HDL only in males.

Conclusion: Increasing severity of obstructive sleep apnea hypopnea syndrome was associated with impaired glucose tolerance ,hypertriglyceridemia and hypercholesterolemia. Obstructive sleep apnea hypopnea syndrome was associated with decreasing HDL levels only in males.

KEYWORDS : Obstructive sleep apnea,glucose intolerance,dyslipidemia

INTRODUCTION

Sleep is a complex, highly organized state that is fundamental to life. Sleep has effect on memory consolidation and has restorative function for energy and alertness. Obstructive sleep apnea hypopnea syndrome (graded according to apnea hypopnea index) causes sleep disruption and has many adverse effects on physical health, psychological health and leads to sleep deprivation of the partner also. It causes daytime sleepiness, cardiovascular effects, stroke, memory impairment and increased susceptibility to road traffic accidents. Cardiovascular risk factors are in part due to metabolic derangements like insulin resistance and dyslipidemia seen with obstructive sleep apnea hypopnea syndrome.

Struggling for air puts the body in stress and leads to elevated sympathetic activity. There is alteration in glucocorticoid regulation induced by sleep loss, and recurrent intermittent hypoxemia associated with obstructive sleep apnea hypopnea syndrome may facilitate the development of glucose intolerance and insulin resistance.[1,2]

Intermittent hypoxia is independently associated with dyslipidemia. However, the role of Obstructive sleep apnea hypopnea syndrome in causality of dyslipidemia remains to be established.[3]Obesity is a common link in all these problems.

The study aims to further elucidate the relationship between obstructive sleep apnea hypopnea syndrome and dyslipidemia and glucose intolerance in Indian population. Better understanding of these relationships will lead to screening of these complications in patients with obstructive sleep apnea hypopnea syndrome and will certainly affect the management in a positive manner.

OBJECTIVES

- To determine correlation of Obstructive sleep apnea hypopnea syndrome with glucose intolerance and dyslipidemia in general population.

METHODS

- The study was an observational study to determine correlation of Obstructive sleep apnea hypopnea syndrome with glucose intolerance and dyslipidemia in general population. 100 Participants for the study were chosen from healthy attendants of patients who presented to Hamidia hospital either in the OPDs or wards from a period of 1st December 2015 to 31st May 2017 .

Those participants who fully understood the procedure and were willing to undergo a full night in lab polysomnography were chosen for study. ENT consultation to rule out any upper airway obstruction like tonsilar hypertrophy , polyps or enlarged adenoids was taken.

In addition to this participants were also required to undergo routine blood examination the next morning after polysomnography in night. Fasting blood sample was taken for lipid profile and blood sugar.Then the participants had their breakfast and again a blood sample was drawn for post-prandial blood sugar.

INCLUSION CRITERIA

1. Male or female aged between 13 years and 85 years
2. Those who gave signed consent for the study

EXCLUSION CRITERIA

1. Age less than 13 years or more than 85 years.
2. Known Hypothyroid
3. Alcohol consumption
4. Pregnancy
5. Enlarged tonsils or Adenoids

DATA COLLECTION

A predesigned proforma was used to obtain relevant information including name, age sex, marital status, address, , history regarding thyroid disorder etc. ENT reference was taken to rule out upper airway obstruction .A full night in lab polysomnograpghy was done to record electroencephalogram, electrocardiogram, electrooculogram, electromyogram ,respiratory movements of chest, snoring ,SPO_2. The

polysomnogram Alice 5 generated data including central Apnea, obstructive apnea, mixed apnea , index of all these data, apnea hypopnea index and snoring time. Blood sample was taken for lipid profile, fasting and post prandial blood sugar.

Body Mass Index was classified as Normal(18.5-24.9 kg/m^2), overweight (25-29.9 kg/m^2) and obese(>30 kg/m^2).

Lipid levels were classified according to NCEP:ATPIII 2001 criteria.For triglyceride Normal-<150 mg/dl, border line- 150-199 mg/dl, high- 200-499mg/dl.For cholesterol <200 mg/dl- desireable, borderline high- 200-239 mg/dl, high -≥240 mg/dl. For HDL >60mg/dl- protective,≥40mg/dl(in males) and ≥50mg/dl (in female) as normal and <40 mg/dl(in males) and <50mg/dl (in females) as low.

Glucose intolerance was classified according to American Diabetes Association, 2014.Normal glucose tolerance: Fasting blood sugar(FBS)< 100 mg/dl and Post prandial blood sugar(PPBS)<140 mg/dl. Impaired glucose tolerance: FBS 100-125mg/dl and PPBS 140-199mg/dl .Diabetes Mellitus:FBS≥126 mg/dl and PPBS≥200 mg/dl.

STATISTICAL ANALYSIS

Statistical analysis was done by using SPSS 19. Statistical analysis and p-value calculation was done by chi square test and z test.

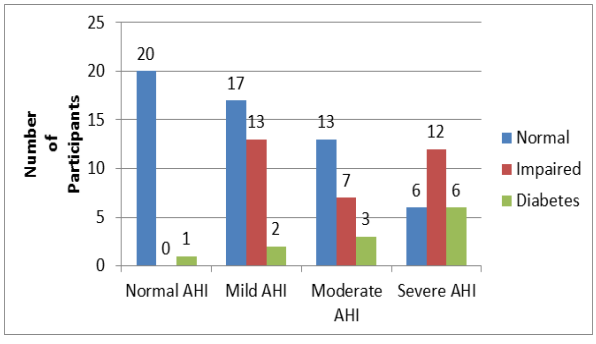
OBSERVATION AND RESULTS

The following observations were made in this study. Out of the 100 participants 21 had normal AHI, 32 had mild AHI, 23 had moderate AHI,24 had severe AHI.

Table 1 shows distribution of study population with respect to glycemic control in different AHI groups .Out of 21 normal AHI participants 20 had normal glycemic control and 1 was diabetic. On the other hand out of 24 participants with severe AHI, 6 had normal glycemic control and 6 were diabetic.12 had impaired glycemic control.The p value for Table 1 comes out to be <0.00001 suggesting a correlation between higher AHI and higher blood sugar.

TABLE 1: APNEA HYPOPNEA INDEX AND BLOOD SUGAR

APNEA HYPOPNEA INDEX	BLOOD SUGAR			TOTAL
	NORMAL	IMPAIRED	DIABETIC	
NORMAL	20	0	1	21
MILD	17	13	2	32
MODERATE	13	7	3	23
SEVERE	6	12	6	24
TOTAL	56	32	12	100

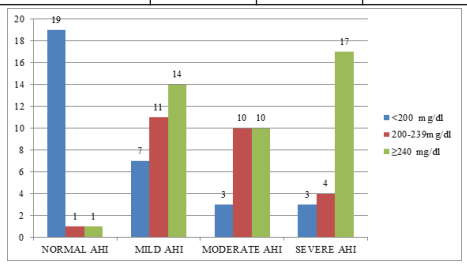


Graph 1- Distribution of study population with respect to glycemic control in different AHI groups .

Table 2 shows distribution of study population with respect to different serum cholesterol levels in different AHI groups .Out of 21 normal AHI participants 19 had a serum cholesterol level less than 200 mg/dl,1each had serum cholesterol level between 200-239 mg/dl and greater than or equal to 240 mg/dl. On the other hand out of 24 participants with severe AHI 3 had a serum cholesterol level less than 200 mg/dl,4 had serum cholesterol level between 200-239 mg/dl and 17 had serum cholesterol level greater than or equal to 240 mg/dl. The p value for Table 2 comes out to be <0.00001 suggesting a statistically significant relation between increasing severity of hypercholesterolemia and obstructive sleep apnea and hypopnea syndrome.

TABLE 2: APNEA HYPOPNEA INDEX AND SERUM CHOLESTEROL

APNEA HYPOPNEA INDEX	SERUM CHOLESTEROL(mg/dl)			Total
	<200	200-239	≥240	
Normal	19	1	1	21
Mild	7	11	14	32
Moderate	3	10	10	23
Severe	3	4	17	24
Total	**32**	**26**	**42**	**100**

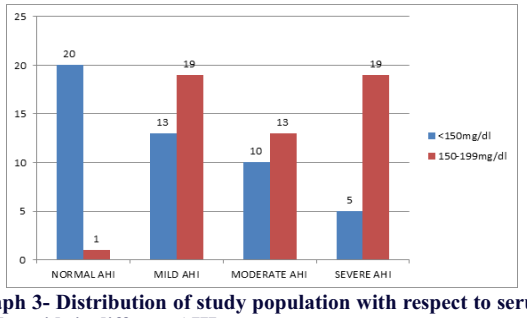


Graph 2- Distribution of study population with respect to serum cholesterol in different AHI groups .

Table 3 shows the distribution of the study population with respect to different serum triglyceride levels in different AHI groups. Out of 21 normal AHI participants, 20 had serum triglyceride level less than 150 mg/dl and 1 had serum triglyceride level between 150-199 mg/dl.On the other hand out of 24 participants with severe AHI 5 had a serum triglyceride level less than 150 mg/dl and 19 had serum triglyceride level between 150-199 mg/dl .The p value for Table 3 comes out to be <0.00001 .

TABLE 3: APNEA HYPOPNEA INDEX AND SERUM TRIGLYCERIDE

APNEA HYPOPNEA INDEX	SERUM TRIGLYCERIDE(mg/dl)			Total
	<150	150-199	≥200	
Normal	20	1	0	21
Mild	13	19	0	32
Moderate	10	13	0	23
Severe	5	19	0	24
Total	**48**	**52**	**100**	**100**

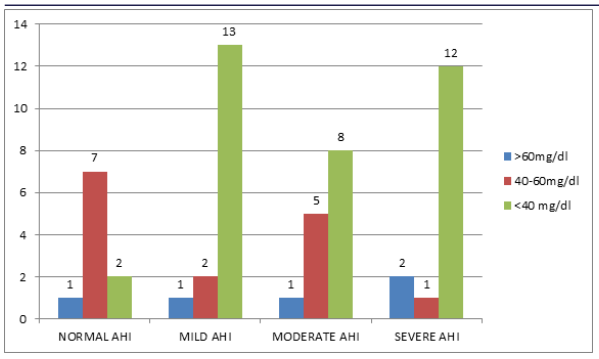


Graph 3- Distribution of study population with respect to serum triglyceride in different AHI groups.

Table 4 shows the distribution of the study population with respect to different serum HDL levels in different AHI groups for males .Out of 10 normal AHI male participants 1 had a serum HDL level greater than 60 mg/dl,7 had serum HDL level between 40-60 mg/dl and 2 had serum HDL level less than 40 mg/dl. Out of 15 male participants with severe AHI, 2 had serum HDL level greater than 60 mg/dl,1 had serum HDL level between 40-60 mg/dl and 12 had serum HDL level less than 40 mg/dl. The p value for Table 4 comes out to be <0.01559 suggesting that in males having higher apnea hypopnea index was associated with lower serum HDL .

TABLE 4: APNEA HYPOPNEA INDEX AND SERUM HDL FOR MALES

APNEA HYPOPNEA INDEX	SERUM HDL(mg/dl)			Total
	>60	40-60	<40	
Normal	1	7	2	10
Mild	1	2	13	16
Moderate	1	5	8	14
Severe	2	1	12	15
Total	5	15	35	55

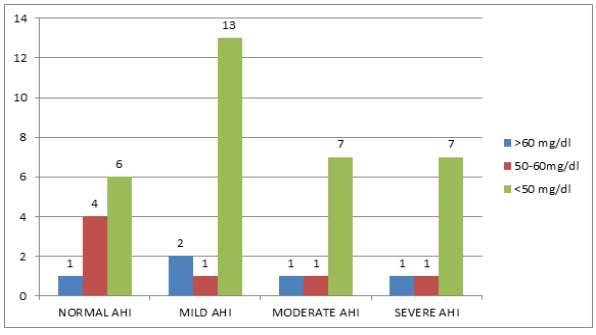


Graph 4- Distribution of study population with respect to serum HDL in different AHI groups in males.

Table 5 shows distribution of study population with respect to different serum HDL levels in different AHI groups for females .Out of 11 normal AHI female participants, 1 had a serum HDL level greater than 60 mg/dl and 6 had serum HDL level less than 50 mg/dl. Out of 9 female participants with severe AHI, 1 had a serum HDL level greater than 60 mg/dl and 7 had serum HDL level less than 50 mg/dl. The p value for Table 5 comes out to be <0.5484 which is more than 0.05.This means that correlation between higher AHI and lower serum HDL was not statistically significant in females.

TABLE5: APNEA HYPOPNEA INDEX AND SERUM HDL FOR FEMALES

APNEA HYPOPNEA INDEX	SERUM HDL(mg/dl)			Total
	>60	50-60	<50	
Normal	1	4	6	11
Mild	2	1	13	16
Moderate	1	1	7	9
Severe	1	1	7	9
Total	**5**	**7**	**33**	**45**



Graph 5- Distribution of study population with respect to serum HDL in different AHI groups in females.

DISCUSSION

Changes in various metabolic parameters like lipid level or glucose level are seen in obstructive sleep apnea and hypopnea syndrome.

In this present study an attempt has been made to determine correlation of obstructive sleep apnea hypopnea syndrome with glucose intolerance and dyslipidemia in general population.A random 100 persons were chosen for the study who agreed to undergo a full night in lab polysomnography and also agreed for blood investigations. Of these, 55 were males and 45 were females. Out of the 55 males 18.18% had no OSA. 29.1%, 25.45%, and 27.27% had mild, moderate and severe OSA respectively. In females 24.44% were normal 35.55% had mild and 20% each had moderate and severe obstructive sleep apnea.

Both diabetes mellitus and OSA are common disorders and frequently coexist. The relationship between them is now being evaluated. Obesity is obviously a common link. Apart from this diabetes mellitus may also lead to OSA by autonomic neuropathy because respiration in sleep is controlled by autonomic nervous system. A large number of studies have shown OSA is associated with insulin resistance and glucose intolerance[4,5,6].In this study mean fasting blood sugar in normal, mild, moderate and severe AHI was 87.52 mg/dl,103.5 mg/dl,107.13 mg/dl,114.12 mg/dl respectively.

The mean Post Prandial blood sugar in normal, mild, moderate and severe AHI was 125.28 mg/dl,142.43 mg/dl,152.03 mg/dl and 165.16 mg/dl respectively.

The P value was <0.05 which proved a significant correlation between increasing AHI and poor glycemic control.

In normal AHI patients, 20 had normal glucose tolerance and only 1 was diabetic. However, in severe AHI group 6 were normal, 12 had impaired glucose tolerance and 6 were frankly diabetic.

A clear relationship of obstructive sleep apnea and hypopnea syndrome and dyslipidemia is yet to be determined. There is increasing evidence that chronic intermittent hypoxia a major component of obstructive sleep Apnea is independently associated with and probably the root cause of dyslipidemia via generation of steroyl co enzymeA desaturase I and reactive oxygen species, peroxidation of lipid and sympathetic system dysfunction.[7] Chow et al[8] concluded that desaturation index was a significant independent risk factor contributing to hypercholesterolemia and hypertriglyceridemia. In our study AHI was significantly related to serum cholesterol level with P < 0.0001. 17(>70%) person with severe AHI had serum cholesterol level > 240 where as only 1 person with normal AHI had serum Cholesterol > 240. The mean serum cholesterol in normal, mild, moderate, severe AHI Group was 166.76 mg/dl,225.09 mg/dl,233.91 mg/dl,257.45 mg/dl respectively.

Similarly, increasing AHI was significantly related with serum triglyceride with P value < 0.00001. 19 out of 24 person with severe AHI had a higher level of serum triglyceride (between 155-199 mg/dl). The mean serum triglyceride in normal, mild, moderate, severe AHI Group was 102.71 mg/dl, 147.96 mg/dl,148.21 mg/dl,157. 85 mg/dl respectively.

In males severe AHI was associated with lower HDL. However, in females the p value was not statistically significant.

LIMITATIONS

This study was done at a single center and that too with only 100 participants. Sleep is a very complex process and to support and confirm the findings in this study, multicenter trial with more study participants will be required.

CONCLUSION

The present cross sectional observation study was carried out in 100 persons (healthy attendants of patients presenting to Hamidia Hospital) to study the correlation between anthropometric measurements and sleep related respiratory disorders in general population. Increasing AHI was associated with poor glycemic control .Increasing AHI was significantly associated with both increasing serum cholesterol and increasing serum triglyceride .Lower level of HDL was found in males higher AHI .Such significance was not seen in females. More elaborated study with higher sample size would be helpful in future to confirm the above findings.

References

1 Ip MS, Lam BI, Ng MM, Lam WK, Tsang KW, Lam KS. Obstructive sleep apnea is independently associated with insulin resistance. American journal of respiratory and critical care medicine. 2002 Mar 1;165(5):670-6.
2 Spiegel K, Leproult R, Van Cauter E. Impact of sleep debt on metabolic and endocrine function. The lancet. 1999 Oct 23;354(9188):1435-9.
3 Drager LF, Jun J, Polotsky VY. Obstructive sleep apnea and dyslipidemia: implications for atherosclerosis. Current opinion in endocrinology, diabetes, and obesity. 2010 Apr;17(2):161
4 Pamidi S, Tasali E. Obstructive sleep apnea and type 2 diabetes: is there a link?. Frontiers in neurology. 2012;3
5 Strohl KP, Novak RD, Singer W, Cahan C, Boehm KD, Denko CW, Hoffstein VS. Insulin levels, blood pressure and sleep apnea. Sleep. 1994 Oct 1;17(7):614-8.
6 Punjabi NM, Shahar E, Redline S, Gottlieb DJ, Givelber R, Resnick HE. Sleep-disordered breathing, glucose intolerance, and insulin resistance: the Sleep Heart Health Study. American journal of epidemiology. 2004 Sep 15;160(6):521-30.
7 Adedayo AM, Olafiranye O, Smith D, Hill A, Zizi F, Brown C, Jean-Louis G. Obstructive sleep apnea and dyslipidemia: evidence and underlying mechanism. Sleep and Breathing. 2014 Mar 1;18(1):13-8..
8 Chou YT, Chuang LP, Li HY, Fu JY, Lin SW, Yang CT, Chen NH. Hyperlipidaemia in patients with sleep-related breathing disorders: prevalence & risk factors.