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Original Research Paper

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OBSTRUCTIVE SLEEP APNEA (OSA): COMMON AND UNDER DIAGNOSED CONDITION WITH MULTIPLE PREDICTORS & RISK FACTORS

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ABSTRACT Background- OSA is associated with many risk factors & co-morbidities. Present study was carried out to study the prevalence of risk factors & co-morbidities in OSA patients. Material & methods- Patients presented with symptoms of OSA in pulmonary medicine OPD/ IPD of a tertiary care hospital were enrolled. A cross sectional study of 50 patients was done where polysomnography was performed to confirm the diagnosis. Results- ESS score was normal (0-9) in 24 (48%) patients, borderline (10-12) in 12 (24%) patients & abnormal (>12) in 14 (28%) patients,52% cases were hypertensive, diabetes in 30%, CVE in 2%, daytime sleepiness in 52%, IHD in 18%, hypothyroidism in 28%, metabolic syndrome in 44%, 36% of patients had depressive symptomas, COPD in 34% & dyslipidemia in 40%. Conclusion- Risk factors of OSA are easy to interpret and their role in consequences of OSA is noteworthy. The risk factors of OSA should be evaluated for early diagnosis and to avoid complications.

KEYWORDS : Obstructive sleep apnea, Waist-hip ratio, risk factors, body mass index, neck circumference

INTRODUCTION-

Obstructive sleep apnea is a sleep disorder characterised by recurrent episodes of upper airway collapse during sleep with persistent respiratory effort[1]

Guilleminault et al first coined term "Sleep Apnea syndrome" based on polysomnographic findings. It is defined as at least 30 apnoeas of minimum duration of 10 seconds detected during sleep.[2]

In healthy urban Indian males (35-65 years) Mumbai during a routine health check-up revealed prevalence of OSA as 19.5% and OSAS as 7.5%.[3] In study in Delhi from 2003 -2005 between 30-60 years of age by polysomnographic evidences showed prevalence of 13.74% and 3.57% for OSA and OSAS respectively.[4] Menopause increases the risk of OSA due to weight gain and decrease in hormone levels.[5]

EDS is a key symptom of OSA. It starts with passive activities during daytime and progresses to active activities which require alertness and attentiveness.[6]

Excessive daytime somnolence is most frequently assessed by a sleep physician using the Epworth Sleepiness Scale (ESS). This questionnaire determines how frequently the patient is likely to doze off. An ESS score more than or equal to 10 is generally considered sleepy. The ESS is useful for evaluating responses to treatment. It decreases with effective treatment.[7]

Neck circumference >16 inches (40.6 cm) in women and > 17 inches (43.2 cm) in men is highly suggestive of OSAS.[8] It has been studied that neck circumference is one of the most important factor for OSA and its severity.[9] There is increased risk of metabolic complications for men with a waist circumference of ≥ 102 cm and women with a waist circumference of ≥ 89 cm.[10]. Higher WHR (>1.0 in men; >0.85 in women) indicates abdominal fat accumulation. It is associated with increased risk for cardiovascular and respiratory disorders.[10] Modified Mallampati classification correlates tongue size to pharyngeal size.[11]

Polysomnography(PSG)

The standard diagnostic test for OSA is an attended in-laboratory polysomnography or portable monitoring (PM).[12] Polysomnography records large number of detailed information from various organ systems during sleep. In laboratory Polysomnography with electroencephalography enabled sleep staging is "Gold standard" for diagnosis of OSA.13 In patients having high pre test probability of moderate to severe OSA without co-morbid sleep or medical disorders, portable monitoring with type III and type IV sleep studies in conjunction with comprehensive sleep evaluation is adequate for diagnosis of OSA.[14] Computerised polysomnogram system includes readings of four electroencephalograms, bilateral electro-oculograms, chin electromyogram, electrocardiogram, airflow by nasal pressure transducer and oro-nasal thermocouples, chest and abdominal wall motion by piezoelectrodes and pulse oximeter. Polysomnography is done under supervision of trained technician with seven channels minimum. The data is analysed. Sleep stages are scored at 30 sec sequential recordings named epochs. Each epoch is recorded on a 30 cm piece of paper at a rate of 1 cm/sec. Nowadays this procedure is digitalised.[14] Polysomnography is useful in patients with excessive daytime sleepiness without objective evidence of OSA. High cost, limited availability is the most important drawbacks.[14]

Various Levels of sleep studies are as follows–

Level I sleep study (Attended in–laboratory Polysomnography)

Level I study is carried out overnight in laboratory, attended by well trained technician. It is "Gold standard" for evaluation of sleep and sleep disordered breathing[1 2 9]. The parameters evaluated are sleep stages, ventilator parameters, cardiac function and limb movements[1 3 0]. It is evaluated by EEG, EOG, ECG, EMG, nasal and oral airflow, chest and abdominal movements and pulse oximeter.[15].

Level II Study (Unattended Polysomnography)

This level records same variables with evaluation of same parameters as in type I in absence of technician.[16]

Level III Study

Minimum of four channels, including two channels of airflow, heart rate, oxygen saturation attended or unattended.

Level IV study

Itmeasures oxygen saturation or airflow, usually unattended. Portable monitoring is an alternative to PSG.[17]

Diagnostic criteria for OSA[18] used in our study.

Diagnosticcriteria:A,BplusDorCplusD

A.

1. Sleepiness,hypersomnolence,exhaustionorinsomnia.
2. Arousalswithfeelingofasphyxiation/Suffocation.
3. Snoring,breathingpauseswitnessedbysleeppartner.

B.

1. Apnea,Hypopneaorrespiratoryeffortrelatedarousals(RERA)≥ 5/hoursleep
2. Recordingofrespiratoryeffortduringpartorthewholeevent.

C.

1. Apnea,HypopneaorRERA's≥15perhourofsleep.
2. Recordingofrespiratoryeffortduringpartorthewholeevent.

D. The disorder cannot be attributed to other conditions, use of medicinesorothersubstances.

Aimsandobjectives-

I. TostudytheprevalenceofriskfactorsinOSApatients
II. TostudycomorbidityfactorsinpatientswithOSA.

Material&methods-

Patients with symptoms of OSA who presented to pulmonary medicine OPD/ IPD of a tertiary care hospital, between January 2013 andSeptember2014wereenrolledinthestudy.Aftergettingapproval from the ethics committee, written informed consent was obtained fromallparticipants.

It was cross sectional study.

INCLUSIONCRITERIA-

1. Patientsabove18yearsofage.
2. Patients having associated co morbidities like COPD, bronchial asthma,Interstitiallungdisease
3. Patientswillingtoparticipateinthestudy.

EXCLUSIONCRITERIA-

1. Patientsnotwillingtoparticipateinthestudy.
2. PatientswhowerealreadydiagnosedwithcasesofOSA.
3. Patientswhowerehemodynamicallyunstable,
4. Patients diagnosed with heart failure, psychiatry illness or on medications.
6. Patientswhohadundergoneheadneck,throatsurgery.
7. Patientswhowerenotabletoco-operateforovernight polysomnography.

Total50subjectswerefinallyincludedinstudy.Theywereevaluatedon the basis symptoms, ESS, lab investigations, risk factors and co morbidities. Other investigations included - Pulmonary function test and ECG. All patients underwent overnight level II PSG where parameterslikeAHI,RDIwereevaluated.

Patients were evaluated for excessive daytime sleepiness using ESS scaleandwerecategorisedintonormal,borderline&highrisk.

BMI, Neck circumference, Hip circumference, Waist circumference weremeasured.WaistHipratiowascalculated**.**

Blood pressure, ENT evaluation & Psychiatry evaluation was done in everypatient.

In all patients, Level II overnight Polysomnography was carried out using computerised polygram system Philips Respironics Alice PDx. Thefollowingsignalswereincluded;twochannelsofEEG(C3-M2,C4-M1),twochannelsofelectrooculogram(R-EOG,L-EOG),onechannel of submental electro myogram, and three channels for ECG. Airflow was measured using nasal cannula. Arterial oxyhemoglobin saturation was measured with the help of finger pulse oxymeter. Thoracic and abdominal movements were recorded by inductive plethysmography. The computerised polysomnographic system used for this study was ALICE Sleepware software in department of pulmonarymedicine.

Definitionsofpolysomnographyeventsinstudy

Apnea–Hypopneaindex(AHI)–

$$AHI = \frac{\text{TotalnoofobstructiveApneas+Totalnoofhypopneas}}{\text{Totaldurationofsleeptime}}$$

Arousal–Itisdefinedasasudden changeofEEGfrequencyconsisting ofalphaandthetaactivityorwaveformswithfrequencygreaterthan16

Respiratory disturbance index (RDI) – The sum of apneas, hypopneas and respiratory effort related arousals per hour of sleep confirmedbyEEG.

OSAseveritycategoriesweredefinedasfollows

1. MildOSA–AHI≥5but<15
2. ModerateOSA–AHI≥15but<30
3. SevereOSA–AHI≥30

STATISTICAL ANALYSIS- Data was entered in excel software, and analysed using IBM-SPSS-25 software. Frequency tables were prepared and appropriate statistical test like Chi – square and correlationwereapplied.

RESULTS

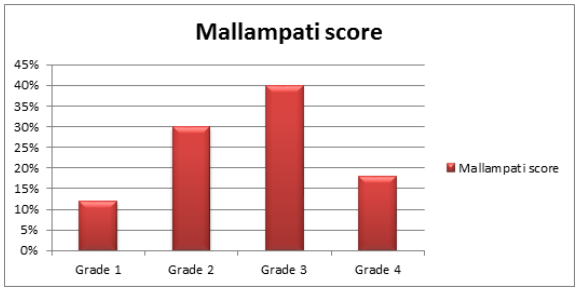
Inourstudy,meanagewas51.08years±12.261yearswithminimumof 26yearsandmaximumof84years.Meanvaluesofheightwere161.82 cms±9.475cms.MeanBMIwere30.09Kg/m^2±3.958withminimumBMI of 24.16 Kg/m^2 and maximum BMI of 42.010 Kg/m^2 .Mean waist circumferencewas106.48±9.247,meanneckcircumferencewas40.98 ±2.630whilemeanweightwas78.80±11.848.Meanwaist-hipratiowas 0.999. Waist Hip ratio is greater than or equal to 0.85 in 97% of female patients. As WHR is a marker of OSA, study demonstrates that there is highprevalenceofhigherWHRinOSApatients.

TABLE1:DEMOGRAPHICPARAMETERSOFSTUDYPOPULATION

N=50	Mean	Median	Std. Deviation	Minimum	Maximum
Age (yrs)	51.08	50.00	12.261	26	84
Height (cms)	161.82	161.50	9.475	143	182
Weight (kgs)	78.80	74.50	11.848	63	120
BMI (Kg /m2)	30.09368	29.415	3.959	24.160	42.010
Waist circumference (cm)	106.20	106.00	9.247	88	126
Hip Circumference (cm)	106.4800	105.0	8.288	93.00	130.00
Neck circumference (cm)	40.98	40.00	2.630	36	47
Waist – Hip ratio	0.999	1.01	0.865	0.82	1.16
ESS score	10.90	10.00	3.945	4	22

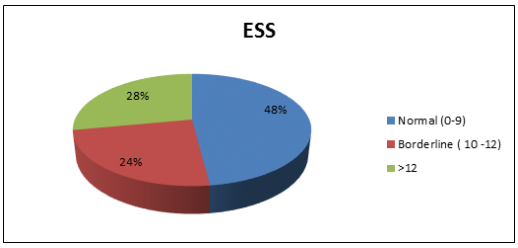
In our study, majority of patients i,e.20 (40%) patients had grade III Mallampati score while 15 (30%) had grade II Mallampati score followedbygradeIVin9(18%)patientsandgradein6(12%)patients.29 (58%)patientshadgradeIIIandgradeIVMallampatiscore.

FIGURE1:FREQUENCYDISTRIBUTIONOFMODIFIED MALLAMPATISCOREINSTUDYPOPULATION



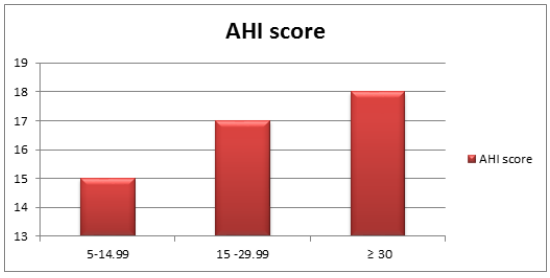
Inpresentstudy,allpatientswere subjectedtoESSquestionnaire and underwentlevelIIIPSG.Outof50patients,ESSscorewasnormal(0-9)in 24 (48%) patients, borderline (10-12) in 12 (24%) patients & abnormal (>12)in14(28%)patients

FIGURE2:FREQUENCYDISTRIBUTIONOFESSSCORE



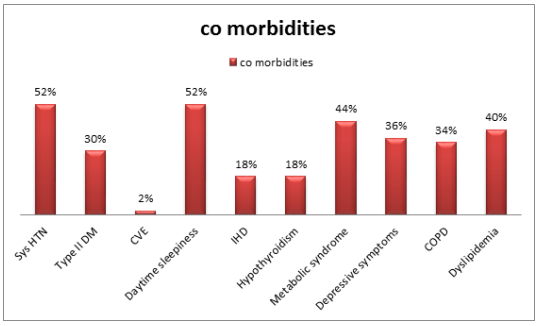
Inpresentstudy,outof50patients,15(30%)patientshadAHIscoreof5-14.99,17(34%)patientshadAHIscoreof15-29.99while18(36%)hadAHIscoreof≥30.

FIGURE3:FREQUENCYDISTRIBUTIONOFAHISCORE



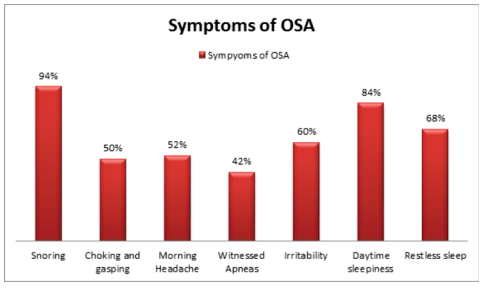
Inourstudy52%caseswerehypertensive,diabetesin30%,CVEin2%,daytimesleepinessin52%,IHDin18%, hypothyroidismin28%,metabolicsyndromein44%,36%ofpatientshaddepressivesymptomas,COPDin34%&dyslipidemiain40%.

FIGURE4:STUDYOFCOMORBIDILLNESSINOURSTUDY



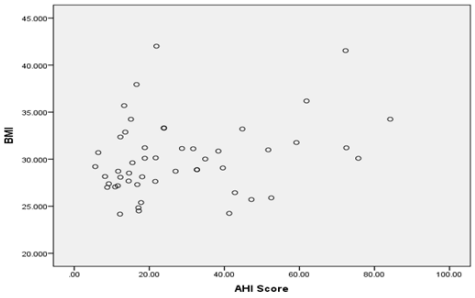
In present study, snoring was present as most common symptom in 94%patientsfollowedbydaytimesleepinessandrestlesssleepin84%and68%respectively.Irritabilitywasseenin60%,chokingandgaspingsensationwhileasleepwaspresentin50%,morningheadachein52%&witnessedapneasin42%.

FIGURE5:CLINICALSYMPTOMSOFOSA



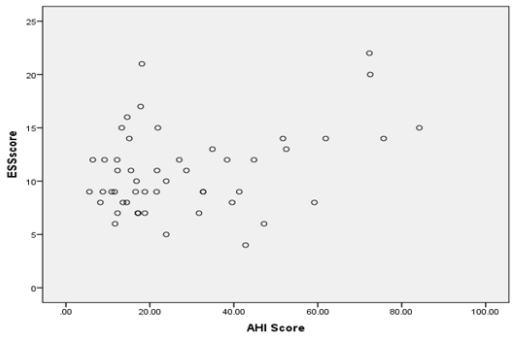
Pearson's correlation i.e. r value is 0.276 which indicates positive correlationbetweenBMIandAHIscoressuggestingincreaseinAHIwithincreaseinBMI

FIGURE6-:CORRELATIONBETWEENAHIANDBMI



Pearson's correlation i.e. r value is 0.36 which indicates positive correlationbetweenAHIandESSscoressuggestingincreaseinAHIwithincreaseinESSscore

FIGURE7:CORRELATIONBETWEENAHIANDESS



DISCUSSIONANDCONCLUSION

The present study is a clinic based cross sectional study. Snoring was present as most common symptom in 94% patients followed by daytime sleepiness and restless sleep in 84% and 68% respectively. Choking and gasping sensation while asleep was present in 50%, morning headache in 52%. There was significant correlation between variables like BMI, ESS, Neck circumference and Metabolic syndrome with AHI. All patients were subjected to ESS questionnaire (Annexure IV) and underwent level III PSG. Mean ESS score in this study population was 10.90.It was observed that the values of RDI and AHI in study population were identical which can be explained on the fact the scoring of arousals were strictly defined as per AASM criteria29. In our study, majority of patients i,e.20 (40%) patients had grade III Mallampati score while 15 (30%) had grade II Mallampati score followedbygradeIVin9(18%)patientsandgradeIin6(12%)patients.29 (58%) patients had grade III and grade IV Mallampati score. In present study, out of 50 patients, 15 (30%) patients had AHI score 5-14.99, 17 (34%) patients had score between 15-29.99 while 18 (36%) had score ≥ 30.

In our study 52% cases were hypertensive, diabetes in 30%, CVE in 2%, daytime sleepiness in 52%, IHD in 18%, hypothyroidism in 28%, metabolic syndrome in 44%, 36% of patients had depressive symptomas, COPD in 34% & dyslipidemia in 40%. Joule J. Li et al (2014) showed prevalence of hypertension as 236 (61.8%), diabetes in 66 (17.3%), Depression as 49 (13.5%) in previously undiagnosed OSA cases.21 Robichaud-Hallé L et al (2012) study of OSA with morbidities showed prevalence as hypertension in 63 (52.5%), Diabetes as 31 (25.8 %), depression in 35 (29.2%), heart disease. as 30 (25%), 12(10%) prevalence of Thyroid disease among 120 OSA patients.22

Our study shows AHI and neck circumference are positively correlated with p value 0.023. Cut off value of neck circumference for male was 43 cm and for female was 40cm respectively.

In present study, 44% patients were overweight, 48% were obese while only 8% were with normal BMI. BMI shows positive correlation with AHI with p value 0.05 which is statistically significant. Chen X et al

30 published in 2014 that obesity was present in 32.8% of OSA patients. Waist Hip ratio is greater than or equal to 0.85 in 97% of female patients. As WHR is a marker of OSA, study demonstrates that there is high prevalence of higher WHR in OSA patients. Male gender, higher grade Mallampati score, higher BMI, increased neck circumference and waist hip ratio are risk factors associated with OSA. Systemic hypertension is most common comorbidity associated with OSA. Metabolic syndrome, diabetes mellitus, hypothyroidism are another comorbidities which contribute for development of OSA

Risk factors for OSA along with co morbidities were significantly prevalent. This shows that risk factors are easy to interpret and their role in consequences of OSA is noteworthy. The risk factors of OSA should be evaluated for early diagnosis and to avoid complications.

LIMITATIONS AND SCOPE FOR FUTURE RESEARCH

- Purposive sampling methods
- Areas based research

Future research is required to further delineate and characterize the prevalence of risk factors & co-morbidities in OSA patients.

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CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

REFERENCES

1. Guilleminault C, Tilkian A, Dement WC. The sleep apnea syndromes. Annu Rev Med. 1976;27:465–84
2. Guilleminault C, Eldridge FL, Dement WC. Insomnia with sleep apnea: a new syndrome. Science.1973Aug31;181(4102):856–8.
3. Udwadia ZF, Doshi AV, Lonkar SG, Singh CI. Prevalence of sleep-disordered breathing and sleep apnea in middle-aged urban Indian men. Am J Respir Crit Care Med. 2004 Jan 15;169(2):168–73.
4. Sharma SK, Kumpawat S, Banga A, Goel A. Prevalence and risk factors of obstructive sleep apnea syndrome in a population of Delhi, India. Chest. 2006 Jul;130(1):149–56.
5. Eichling PS, Sahni J. Menopause related sleep disorders. J Clin Sleep Med JCSM Off Publ Am Acad Sleep Med. 2005 Jul 15;1(3):291–300.
6. Sauter, Asenbaum, Popovic, Bauer, Lamm, Klösch, et al. Excessive daytime sleepiness in patients suffering from different levels of obstructive sleep apnoea syndrome. J Sleep Res. 2000 Sep 1;9(3):293–301.
7. Johns MW. A new method for measuring daytime sleepiness: the Epworth sleepiness scale. Sleep. 1991 Dec;14(6):540–5.
8. Sharma SK, Katoch VM, Mohan A, Kadhiravan T, Elavarasi A, Ragesh R, et al. Consensus & Evidence-based INOSA Guidelines 2014 (First edition). Indian J Med Res. 2014 Sep;140(3):451–68.
9. Ahbab S, Ataoğlu HE, Tuna M, Karasulu L, Cetin F, Temiz LU, et al. Neck circumference, metabolic syndrome and obstructive sleep apnea syndrome; evaluation of possible linkage. Med Sci Monit Int Med J Exp Clin Res. 2013;19:111–7.
10. Martinez-Rivera C, Abad J, Fiz JA, Rios J, Morera J. Usefulness of truncal obesity indices as predictive factors for obstructive sleep apnea syndrome. Obes Silver Spring Md. 2008 Jan;16(1):113–8.
11. Mallampati SR, Gatt SP, Gugino LD, Desai SP, Waraksa B, Freiberger D, et al. A clinical sign to predict difficult tracheal intubation: a prospective study. Can Anaesth Soc J. 1985 Jul;32(4):429–34.
12. Epstein LJ, Kristo D, Strollo PJ, Friedman N, Malhotra A, Patil SP, et al. Clinical guideline for the evaluation, management and long-term care of obstructive sleep apnea in adults. J Clin Sleep Med JCSM Off Publ Am Acad Sleep Med. 2009 Jun 15;5(3):263–76.
13. National Guideline Clearinghouse | Management of obstructive sleep apnoea/hypopnoea syndrome in adults. A national clinical guideline. [Internet]. [cited 2014 Dec 7]. Available from: http://www.guideline.gov/content.aspx?id=3878
14. Collop NA, Anderson WM, Boehlecke B, Claman D, Goldberg R, Gottlieb DJ, et al. Clinical guidelines for the use of unattended portable monitors in the diagnosis of obstructive sleep apnea in adult patients. Portable Monitoring Task Force of the American Academy of Sleep Medicine. J Clin Sleep Med JCSM Off Publ Am Acad Sleep Med. 2007 Dec 15;3(7):737–47.
15. Kushida CA, Littner MR, Hirshkowitz M, Morgenthaler TI, Alessi CA, Bailey D, et al. Practice parameters for the use of continuous and bilevel positive airway pressure devices to treat adult patients with sleep-related breathing disorders. Sleep. 2006 Mar;29(3):375–80.
16. Iber C, Redline S, Kaplan Gilpin AM, Quan SF, Zhang L, Gottlieb DJ, et al. Polysomnography performed in the unattended home versus the attended laboratory setting--Sleep Heart Health Study methodology. Sleep. 2004 May 1;27(3):536–40.
17. Collop NA, Tracy SL, Kapur V, Mehra R, Kuhlmann D, Fleishman SA, et al. Obstructive sleep apnea devices for out-of-center (OOC) testing: technology evaluation. J Clin Sleep Med JCSM Off Publ Am Acad Sleep Med. 2011 Oct 15;7(5):531–48.
18. Tsara V, Amfilochiou A, Papagrigorakis MJ, Georgopoulos D, Liolios E. Guidelines for diagnosis and treatment of sleep-related breathing disorders in adults and children. Definition and classification of sleep related breathing disorders in adults: different types and indications for sleep studies (Part 1). Hippokratia. 2009 Jul;13(3):187–91.
19. Denker MG, Cohen DL. Use of continuous positive airway pressure for sleep apnea in the treatment of hypertension. Curr Opin Nephrol Hypertens. 2014 Sep;23(5):462–7.
20. Deng X, Gu W, Li Y, Liu M, Li Y, Gao X. Age-group-specific associations between the severity of obstructive sleep apnea and relevant risk factors in male and female patients. PloS One. 2014;9(9):e107380.
21. Li JJ, Appleton SL, Wittert GA, Vakulin A, McEvoy RD, Antic NA, et al. The relationship between functional health literacy and obstructive sleep apnea and its related risk factors and comorbidities in a population cohort of men. Sleep. 2014 Mar;37(3):571–8.
22. Robichaud-Hallé L, Beaudry M, Fortin M. Obstructive sleep apnea and multimorbidity. BMC Pulm Med. 2012;12:60.
23. Hiestand DM, Britz P, Goldman M, Phillips B. Prevalence of symptoms and risk of sleep apnea in the US population: Results from the national sleep foundation sleep in America 2005 poll. Chest. 2006 Sep;130(3):780–6.
24. Jniene A, elFtouh M, Fihry MTelF. Sleep apnea syndrome: experience of the pulmonology department in Ibn Sina Hospital, Rabat, Morocco. Pan Afr Med J. 2012;13:28.
25. Parish JM, Adam T, Facchiano L. Relationship of Metabolic Syndrome and Obstructive Sleep Apnea. J Clin Sleep Med JCSM Off Publ Am Acad Sleep Med. 2007 Aug 15;3(5):467–72.
26. Agrawal S, Sharma SK, Sreenivas V, Lakshmy R. Prevalence of metabolic syndrome in a north Indian hospital-based population with obstructive sleep apnoea. Indian J Med Res. 2011 Nov;134(5):639–44.
27. Del Campo F, Horner oR, Zamarrón C, Abasolo DE, Alvarez D. Oxygen saturation regularity analysis in the diagnosis of obstructive sleep apnea. Artif Intell Med. 2006 Jun;37(2):111–8.
28. Pływaczewski R, Bieleń P, Bednarek M, Jonczak L, Górecka D, Sliwiński P. [Influence of neck circumference and body mass index on obstructive sleep apnoea severity in males]. Pneumonol Alergol Pol. 2008;76(5):313–20.
29. Sleep-related breathing disorders in adults: recommendations for syndrome definition and measurement techniques in clinical research. The Report of an American Academy of Sleep Medicine Task Force. Sleep. 1999 Aug 1;22(5):667–89.
30. Sleep-related breathing disorders in adults: recommendations for syndrome definition and measurement techniques in clinical research. The Report of an American Academy of Sleep Medicine Task Force. Sleep. 1999 Aug 1;22(5):667–89.