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Research Article

PREVALENCE OF SNORING AND OBSTRUCTIVE SLEEP APNEA AND THEIR ASSOCIATION WITH POOR ACADEMIC PERFORMANCE AMONG HEALTH SCIENCE STUDENTS AT TAIBAH UNIVERSITY

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Abstract:

Background: Obstructive sleep apnea (OSA) is a common disorder characterized by repetitive episodes of nocturnal breathing cessation due to upper airway collapse. Patient with sleep apnea have an increased risk of diurnal hypertension, nocturnal dysrhythmia, right and left ventricular failure, myocardial infarction and stroke. The most common complaints are loud snoring, disrupted sleep and excessive day time sleepiness. Cycles of sleep, snoring, obstruction, arousal and sleep occur throughout the night. Some patients with severe apnea may have episodes of upper airway obstruction a hundred or more times in one hour. Multiple arousals with sleep fragmentation are the likely cause of excessive daytime sleepiness in patients with obstructive sleep apnea. Because many patients are not aware of their heavy snoring and nocturnal arousals, obstructive sleep apnea may remain undiagnosed.

Materials and method: This is a cross-sectional study conducted on health science students at Taibah University in AL-Medina Saudi Arabia during the year 2018/2019. We randomly distributed and collected 537 responses from health science students using Berlin Sleep Questionnaire (BSQ). All questionnaires were properly filled-up therefore; there was no missing data in the finalized dataset. The analysis was performed in 95% confidence interval using Statistical Package for Social Science (SPSS), version 23 (IBM, Armonk, NY, USA). Categorical variables were presented as frequencies and percentages. Continuous variables were presented as mean \pm SD, minimum and maximum values. Prevalence of high risk and low risk for OSA were calculated according to Berlin questionnaire. The finding of BSQ was compared across the gender and GPA by Chi-squared test. Binary logistic regression analysis (method = enter) was done to identify the factors predictive of high risk of OSA.

Results: Total 537 students participated in this study and among them 234 (56.4%) were male. More than half (52.9%) of the respondents were aged between 17 to 22 years while 45.6% were 23 – 28 years old, and remaining 1.5% were more than 28 years old. The mean \pm SD height, weight and BMI of all students were 164.20 \pm 9.94 cm, 66.33 \pm 19.55 kg and 24.35 \pm 5.89 kg/m². 11.9 percent of the participants were at high risk of OSA while 88.1 percent were at low risk. When socio-demographic data was compared between high-risk respondents and low risk respondents, the only statistically significant difference was found for 'gender' (OR 0.521, p .014). The binary logistic regression analysis revealed the only significant predictor for being high-risk patient and that was 'presence of snoring' (OR 0.108, 95% CI 0.041-0.154, p <.001).

Conclusion: Although the findings of this study showed small percentage of students who were at high risk of Obstructive Sleep Apnea, still this prevalence is quite alarming at their young age. In order to decrease the prevalence of risk factors of OSA among health science student, continuous promotion of physical education should be exerted at a school level where physical exercise, eating healthy food, having enough sleep, awareness of sleep disorder should be taught by physical educators constantly.

Keywords: Obstructive Sleep Apnea, Snoring, Berlin Sleep Questionnaires, Prevalence, Academic.

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INTRODUCTION:

Obstructive sleep apnea (OSA) is a common disorder characterized by repetitive episodes of nocturnal breathing cessation due to upper airway collapse [1]. Patient with sleep apnea have an increased risk of diurnal hypertension, nocturnal dysrhythmia, right and left ventricular failure, myocardial infarction and stroke [2,3,4,5]. The most common complaints are loud snoring, disrupted sleep and excessive daytime sleepiness. Cycles of sleep, snoring, obstruction, arousal and sleep occur throughout the night. Some patients with severe apnea may have episodes of upper airway obstruction a hundred or more times in one hour [6]. Multiple arousals with sleep fragmentation are the likely cause of excessive daytime sleepiness in patients with obstructive sleep apnea. Because many patients are not aware of their heavy snoring and nocturnal arousals, obstructive sleep apnea may remain undiagnosed [7].

In the Western world, the prevalence of OSA is 3%–7% in men and 2%–5% in women. Despite lower obesity rates, the prevalence is similar in Asia, possibly due to the craniofacial features among Asians. This finding suggests that OSA is an equally common disorder in both the developing and developed world [8]. Nevertheless, few studies from the Middle East have estimated the prevalence of sleep apnea. Prevalence of obesity and consequent sleep-related breathing disorders are increasing rapidly in the Middle East region (UAE, Kingdom of Saudi Arabia (KSA), Qatar, Bahrain, Kuwait, and Oman) with contribution from sedentary/westernized lifestyles, fast food (rich in fat, salt, sugar, and refined starches), adverse outdoor weather conditions, genetics, and complex interplay of many other factors [9].

One of the main complain of OSA is snoring a rough rattling noise made on inspiration during sleep by vibration of the soft palate and the uvula caused by turbulent airflow through narrowed airways. Snoring is affected by the stage of sleep, sleeping position,

and the use of medications and alcohol [10]. The most important risk factors are male gender, overweight, having a narrow airway, Drinking alcohol, nasal problems, and family history of snoring or obstructive sleep apnea. The narrowing can be in the nose, mouth, or throat. Palatal snoring is often worse when an individual breathes through his or her mouth or has nasal obstruction [11].

The Prevalence and risks of habitual snoring and obstructive sleep apnea symptoms in adult dental patients was present in 18.2% of the females and 81.8% of the males and in a sample of Saudi middle-aged adults. Forty percent of the 2682 enrolled subjects were snorers: 23.5% were habitual snorers, 16.6% were moderate snorers, and 59.9% were non-snorers [12,13].

Sleeping is essential for learning, memory processes and academic performance in children and adolescents [14]. Studies have shown that poor sleep quality, sleeping late, getting up early and interrupted night, sleep impress affect behavior, learning capacity and school performance [15]. In addition, there is evidence of an association between sleep disorder symptoms and neurocognitive disorders, which may be a potential cause of low academic performance in the student population [16].

A cross sectional study was conducted at Jordan University of Science and Technology, they concluded that Snoring and OSA were uncommon among university students. However, both were more common among male students and were associated with poor academic performance. Another cross-sectional epidemiological study in India found that OSA is highly prevalent in Indian primary schools and associated with poor academic performance [17]. The purpose of our study was to determine the prevalence of OSA among health science students in Taibah University and determine its association with poor academic performance [18].

METHODOLOGY:

This is a cross-sectional study conducted on health science students at Taibah University in AL-Medina Saudi Arabia during the year 2018/2019. We randomly collected 537 responses from health science students at Taibah University in Medina.

All health science students at Taibah University in medina city were **included** in this study. Students from other facilities and other universities were **excluded** from this study.

In this study, Berlin Sleep Questionnaire (BSQ) was used to record symptoms of OSA and to estimate prevalence of OSA. It was distributed among health science students to determine the prevalence of Obstructive sleep apnea (OSA), snoring symptoms and their association with poor academic performance. Students were categorized according to their symptoms into three groups (category 1, 2, 3). Students who scored positive in two or more categories were considered as having high risk for OSA. We determined the **Sociodemographic data** in form of (age, gender, nationality, height, weight and BMI). **University related data** as the faculty, academic year and performance that were presented as GPA According to Taibah University regulation, >4.5 (excellent) >3.75 (very good) >2.75 (good). Poor academic performance defined as <2.75. Medical history data as hypertension, cardiac problems and respiratory. Family history and Obstructive sleep apnea (OSA) prevalence and participants categories data depending on Berlin Sleep Questionnaire.

Categorical variables were presented as frequencies and percentages. Continuous variables were presented as mean \pm SD, minimum and maximum

values. Responses to all the OSA related questions were presented as frequencies and percentages. Association between variables of interest was seen by Chi-squared test. The finding of Berlin sleep questionnaire was compared across the gender and GPA by Chi-squared test. Frequencies and percentages of respondents according to Berlin questionnaire categories were presented. Prevalence of high risk and low risk for OSA were calculated according to Berlin questionnaire. Sociodemographic characteristics between high risk and low risk study participants were compared by Chi squared test. Binary logistic regression analysis (method = enter) was done to identify the factors predictive of high risk of OSA.

All the questionnaires were properly filled-up therefore; there was no missing data in the finalized dataset. Missing data management was not required. The analysis was performed in 95% confidence interval using Statistical Package for Social Science (SPSS), version 23 (IBM, Armonk, NY, USA).

RESULTS:

Total 537 students participated in this study and among them 234 (56.4%) were male. More than half (52.9%) of the respondents were aged between 17 to 22 years while 45.6% were 23 – 28 years old and remaining 1.5% were more than 28 years old. The clear majority (98.7%) were Saudi nationals. Most of the respondents (58.8%) were from college of medicine followed by college of dentistry (12.5%). Students from all academic years were included in this study, the highest number were in fifth year (25.0%). The mean \pm SD height, weight and BMI of all students were 164.20 \pm 9.94 cm, 66.33 \pm 19.55 kg and 24.35 \pm 5.89 kg/m². (Table 1).

Table 1: Baseline characteristics of all respondents (n = 537)

Characteristics	N (%) / mean \pm SD
Age	
○ 17 – 22 years	284 (52.9)
○ 23 – 28 years	245 (45.6)
○ More than 28 years	8 (1.5)
Gender	
○ Male	234 (56.4)
○ Female	303 (43.6)
Nationality	
○ Saudi	530 (98.7)
○ Non-Saudi	7 (1.3)
College	
○ College of medicine	316 (58.8)
○ College of dentistry	67 (12.5)
○ College of nursing	43 (8.0)
○ College of medical rehabilitation sciences	38 (7.1)
○ College of pharmacy	24 (4.5)
○ College of clinical nutrition	23 (4.3)
○ College of laboratory science	21 (3.9)
○ College of radiology technology	5 (0.9)
Academic year	
○ Internship	94 (17.5)
○ Fifth year	134 (25.0)
○ Fourth year	118 (22.0)
○ Third year	96 (17.9)
○ Second year	60 (11.2)
○ First year	35 (6.5)
GPA	
○ 4.5 – 5.0	190 (35.4)
○ 3.75 – 4.49	249 (46.4)
○ 2.75 – 3.74	87 (16.2)
○ 2 – 2.74	6 (1.1)
○ < 2	5 (0.9)
Height (in cm)	164 \pm 9.94
Weight (in kg)	66.33 \pm 19.55
BMI (in kg/m²)	24.35 \pm 5.89

Distribution of risk factors of OSA among the respondents were as follows: cardiac disease in 2.1%, family history of OSA in 4.5%, hypertension in 2.2%, and respiratory disease in 6.7% and smoking in 10.6%. Eighty-seven study participants surely knew that they snore during sleep and 5(0.9%) had their snoring so loud that it can be heard from adjacent rooms. 11.7% students responded that their snoring

bothered other people and 15.1% nodded off or fallen asleep while driving a vehicle. When asked about the frequency of falling asleep or nodding off while driving, they answered as follows – never or nearly never by 187 (34.8%), 1-2 times per month by 49 (9.1%), 1-2 times per week by 15 (2.8%), 3-4 times per week by 12 (2.2%) and nearly every day by 11 (2.0%) respondents. (Table 2).

Table 2: Distribution of all patients by responses to the OSA related questions (n = 537)

Question	Responses	N	%
Do you have any of the following conditions? (multiple response question)	<input type="radio"/> Cardiac diseases	11	2.1
	<input type="radio"/> Family H/O OSA	24	4.5
	<input type="radio"/> Hypertension	12	2.2
	<input type="radio"/> Respiratory disease	36	6.7
	<input type="radio"/> Smoking	57	10.6
Do you snore?	<input type="radio"/> Yes	87	16.2
	<input type="radio"/> No	383	71.3
	<input type="radio"/> I don't know	67	12.5
How loud your snoring is?	<input type="radio"/> Slightly louder than breathing	67	12.5
	<input type="radio"/> As loud as talking	32	6.0
	<input type="radio"/> Louder than talking	6	1.1
	<input type="radio"/> Very loud, can be heard in adjacent rooms.	5	0.9
	How often do you snore?	<input type="radio"/> Never or nearly never	39
<input type="radio"/> 1 – 2 times per month		25	4.7
<input type="radio"/> 1 – 2 times per week		30	5.6
<input type="radio"/> 3 – 4 times per week		20	3.7
<input type="radio"/> Nearly everyday		23	4.3
Has your snoring ever bothered other people?	<input type="radio"/> Yes	63	11.7
	<input type="radio"/> No	79	14.7
Has anyone noticed that you quit breathing during your sleep?	<input type="radio"/> Never or nearly never	403	75.0
	<input type="radio"/> 1 – 2 times per month	41	7.6
	<input type="radio"/> 1 – 2 times per week	37	6.9
	<input type="radio"/> 3 – 4 times per week	22	4.1
	<input type="radio"/> Nearly everyday	33	6.1
How often do you feel tired or fatigued after your sleep?	<input type="radio"/> Never or nearly never	181	33.7
	<input type="radio"/> 1 – 2 times per month	140	26.1
	<input type="radio"/> 1 – 2 times per week	96	17.9
	<input type="radio"/> 3 – 4 times per week	64	11.9
	<input type="radio"/> Nearly everyday	55	10.2
During your awake time, do you feel tired, fatigued, or not up to the par?	<input type="radio"/> Never or nearly never	170	31.7
	<input type="radio"/> 1 – 2 times per month	104	19.4
	<input type="radio"/> 1 – 2 times per week	135	25.1
	<input type="radio"/> 3 – 4 times per week	72	13.4
	<input type="radio"/> Nearly everyday	55	10.2
Have you ever nodded off or fallen asleep while driving a vehicle?	<input type="radio"/> Yes	81	15.1
	<input type="radio"/> No	456	84.9
If yes, how often does it occur?	<input type="radio"/> Never or nearly never	187	34.8
	<input type="radio"/> 1 – 2 times per month	49	9.1
	<input type="radio"/> 1 – 2 times per week	15	2.8
	<input type="radio"/> 3 – 4 times per week	12	2.2
	<input type="radio"/> Nearly everyday	11	2.0

Sixty-four (11.9%) respondents had two or more positive categories which made them high risk patients; the other 473 (88.1%) respondents fell in low risk group due to having 1 or no positive category.(Chart 1).

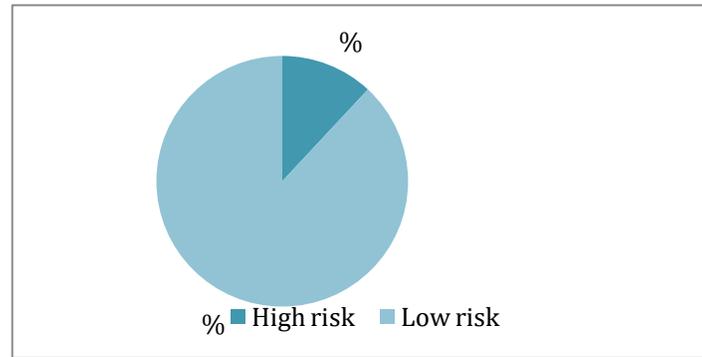


Figure1: the percent of high risk and low risk OSA

When socio-demographic data were compared between high risk respondents and low risk respondents the only statistically significant difference was found for 'gender' (OR 0.521, p .014) with more males in high risk category (57.8%)

compared to females (42.2%). Other socio-demographic characteristics e.g. age, nationality, college, academic year and GPA were not statistically significantly different in high risk vs low risk patients (all p-values >.005) (table 3).

Table 3: Comparison between sociodemographic data of high risk respondents and sociodemographic data of low risk patients by Chi squared test (n = 537)

Characteristics	High risk (n = 64)		Low risk (n = 473)		p-value
	N	%	N	%	
Age					.589
o 17 – 22 years	33	51.6	251	53.1	
o 23 – 28 years	29	45.3	216	45.7	
o More than 28 years	2	3.1	6	1.3	
Gender					.014 (OR 0.521)
o Male	37	57.8	197	41.6	
o Female	27	42.2	276	58.4	
Nationality					.171 (OR 0.331)
o Saudi	2	3.1	5	1.1	
o Non-Saudi	62	96.9	468	98.9	
College					.112
o College of medicine	31	48.4	285	60.3	
o College of dentistry	8	12.2	59	12.5	
o College of nursing	6	9.4	37	7.8	
o College of medical rehabilitation	7	10.9	31	6.6	
o College of pharmacy	2	3.1	22	4.7	
o College of clinical nutrition	5	7.8	18	3.8	
o College of laboratory science	2	3.1	19	4.0	
o College of radiology technology	3	4.7	2	0.4	
Academic year					.493
o Internship	10	15.6	84	17.8	
o Fifth year	18	28.1	116	24.5	
o Fourth year	10	15.6	108	22.8	
o Third year	12	18.8	84	17.8	
o Second year	11	17.2	49	10.4	
o First year	3	4.7	32	6.8	
GPA					.182
o 4.5 – 5.0	27	42.2	163	34.5	
o 3.75 – 4.49	30	46.9	219	46.3	
o 2.75 – 3.74	6	9.4	81	17.1	
o 2 – 2.74	0	0.0	6	1.3	
o < 2	1	1.6	4	0.8	

The binary logistic regression analysis revealed the only significant predictor for being high-risk patient and that was 'presence of snoring' (OR 0.108, 95% CI 0.041-0.154, $p < .001$). The other factors in the

binomial regression model e.g. gender, age, smoking, respiratory disease and cardiac disease were not statistically significant predictors (p -values $> .05$) (Table 4).

Table 4: Binary logistic regression analysis of factors predictive of high risk of OSA

Variables	Odds	95% CI	p-value
Presence of snoring (yes)	0.080	0.154-0.041	<.001
Gender (male)	1.280	2.369-0.692	.432
Age			
o 17-22 yrs	0.523	3.146-0.087	.479
o 23-28 yrs	0.452	2.738-0.075	.388
o More than 28 yrs	ref	-	-
Smoking	0.640	1.461-0.280	.289
Respiratory disease	0.466	1.173-0.185	.105
Cardiac disease	0.667	3.942-0.117	.667

DISCUSSION:

This study tackled the prevalence of snoring and obstructive sleep apnea and their association with poor academic performance among health science students. Findings of this study showed, that 16.2% of the participants were snoring regularly to which 11.9% were at high risk of Obstructive Sleep Apnea (OSA) while 88.1% were at low risk. Looking at the association between high risk and low risk versus socio demographic characteristics of participants, gender showed strong associations while other variables such as; age, nationality, college and academic year showed negative association. We also failed to find any association between GPA versus risk factor of OSA. In predicting the risk factors of OSA, only presence of snoring was statistically significant while other variables included in the regression model revealed no significant difference.

A group of researchers in Taif, Saudi Arabia, assessed the prevalence of high-risk group of obstructive among western region population [19]. They found out the 28% of participants were at high risk of OSA with 72% were at low risk. However, their results showed neither gender nor age shows strong association with the risk factor of OSA. More results in their study showed, only Body Mass Index (BMI) found to be statistically associated with the disease. In comparing this finding to our study outcome, high risk of OSA in their study was registered slightly higher compared to our findings while both of these projects found strong association in one of the socio demographic characteristics. In Central Region, Saudi Arabia, a published paper entitled "Symptoms and risk for obstructive sleep apnea among sample of Saudi Arabia adults" where they wanted to determine the risk and symptoms for OSA among adult selected population [20]. They used BSQ to assess the risk of OSA. They discovered

that, 31.9% of the participants were classified as high risk for OSA. Additional results of their study showed negative association between gender and symptomatic OSA whereas their study indicated that the risk for OSA was very high in both genders and it increases with age and obesity. The high risk of this study was higher than our study findings although the latter study failed to mention positive association on OSA. In Dammam, Saudi Arabia, they reported extremely high on the prevalence of high risk to OSA on men with 78.3% while only 21.7 for women and they found strong association between snoring and risk factors of OSA. However, when they tested the association between socio demographic variables, only BMI including obese patients had shown positive relationship toward OSA although this study was somewhat distinctive in nature because the study subject was an adult dental patient still these study outcomes provided us more insight on the prevalence of OSA in a healthcare setting [21].

A group of professors in Iran conducted a study about "academic performance, sleep disorder and their association in middle school students [22]. They found out those students who had enough and good sleep at night had better academic performance than others. However, its association against academic performance found to be negative. They further elaborated that, academic performance was significantly associated with age and gender. In our study, we also found negative association between Academic performance and risk factor of OSA but we found significant difference in snoring and the disease. While the description of each study was somewhat different in some aspects nevertheless, the main thought of comparison about the association of poor academic performance of students was outlined in the context. In Jordan, a group of researchers indicated that 5.4% of the students surveyed had high

risk of OSA and both self-reported snoring and being at high risk for OSA were associated with poor academic performance [17]. Even though they found positive association on risk factors of OSA and poor academic performance, we still deemed our study outcome substantial enough to validate some of study findings of other articles related to this phenomenon.

Another published study from Chile, accounted 7.8% of the students was deemed as high risk of OSA [23]. Their study indicated that high risk for OSA was associated with age, poor self-rated health, high BMI and smoking but they failed to prove its association with sex, year in college and other important variables however, in Greece the prevalence of OSA was relatively small with only 1 percent of the total sample size [24]. Interestingly, they further elaborated that significantly more women were at high risk than men. Although reported very low frequency of OSA, snoring, obesity, age and gender consist strong predictor of OSA. The prevalence of OSA in our study was slightly higher than the above international studies, these varies from different perspectives such as study settings, study subjects, sample size and timing are some of the factors that might be contributed on the disparity of the findings.

LIMITATIONS:

The generalization of this study is subjected to certain limitations. First, we believe that more variables are needed in order to carefully assess the prevalence of snoring and OSA associated by poor academic performance of health care students i.e. daytime excessive sleepiness, duration of sleep, physical exercise etc. These variables might also be determinants of snoring and OSA. Another factor was about study subjects for which we only collected more data in the college of medicine. This has caused insubstantial of some data findings most especially on measuring association of OSA versus socio demographic characteristics.

RECOMMENDATION:

As we failed to find any association between poor academic performance and OSA, replication of this study is greatly suggested within a multi-center study or in a general school population to assess better, the association of poor academic performance of students against risk factors of OSA.

CONCLUSION:

Although the findings of this study showed small percentage of students who were at high risk of Obstructive Sleep Apnea, still this prevalence is quite alarming at their young age.

In order to decrease the prevalence of risk factors of OSA among health science student, continuous

promotion of physical education should be exerted at a school level where physical exercise, eating healthy food, having enough sleep, awareness of sleep disorder should be taught by physical educators constantly.

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REFERENCES:

- Spicuzza L, Daniela C and Giuseppe D(2015):**Obstructive sleep apnea syndrome and its management. Therapeutic advances in chronic disease, 65 : 273-285.
- Shepard J (1990):**Cardiopulmonary consequences of obstructive sleep apnea. In Mayo Clinic Proceedings, Elsevier, 65(9): 1250-1259.
- Guilleminault C, Stuart J and Roger A(1983):**Cardiac arrhythmia and conduction disturbances during sleep in 400 patients with sleep apnea syndrome." American journal of cardiology, 52: 490-494.
- Hung L, Whitford E, Parsons R and Hillman D(1990):**Association of sleep apnea with myocardial infarction in men. The Lancet, 336(8710):261-264.
- Partinen M and Guilleminault C(1990):**Daytime sleepiness and vascular morbidity at seven-year follow-up in obstructive sleep apnea patients. Chest, 97(1):27-32.
- Aldrich M (1989):**Automobile accidents in patients with sleep disorders. Sleep;12:487-94.
- Gould G, Whyte K, Rhind G, Airlie M, Catterall J and Shapiro C(1998):**The sleep hypopnea syndrome. Am Rev Respir Dis., 137(4):895-8.
- Punjabi N and Naresh M (2008):**The epidemiology of adult obstructive sleep apnea. The American Thoracic Society, 5(2):136-143.
- Vats M and Mayank G(2016) :** Obesity and Sleep-Related Breathing Disorders in Middle East and UAE. Canadian respiratory journal: journal of the Canadian Thoracic Society, (8):1-5.

9. **MedicineNet (2015)**:medical definition of snoring. Retrieved from: <https://www.medicinenet.com/script/main/art.asp?articlekey=5515>
10. **Mayoclinic(2017)**:Snoring. <https://www.mayoclinic.org/diseases-conditions/snoring/diagnosis-treatment/drc-20377701>
11. **Al-jewair T, Nazir M, Al-Masoud N and Al-qahtani N(2016)**:prevalence and risk of habitual snoring and OSA symptoms in adult dental patient. Saudi Medical Journal, 37(2) : 183.
12. **Wail S(2015)**:Prevalence and predictor of habitual snoring in a sample of Saudi middle aged adult. Saudi Medical Journal, 36(8):920.
13. **Curcio H, Giuseppe L, Ferrara M and Gennaro L (2006)**:Sleep loss and learning capacity and academic performance. Sleep medicine reviews, 10(5):323-337.
14. **Anderson B, Isser A and Taylor H (2009)**:Associations of executive function with sleepiness and sleep duration in adolescents. Pediatrics, 123(4):e701-e707.
15. **Chervin S and Ronald D(2003)**:School performance, race, and other correlates of sleep-disordered breathing in children. Sleep medicine, 4(1):21-7.
16. **Khassawneh M, Basheer Y and Alkhatib L(2018)**:The association of snoring and risk of obstructive sleep apnea with poor academic performance among university students. Sleep and Breathing,1-6.
17. **Goyal C, Abhishek B and Girish C(2018)**:Association of pediatric obstructive sleep apnea with poor academic performance, A school-based study from India. Official Organ of Indian Chest Society, 35(2): 132.
18. **Assir M (2018)**:Prevalence of High Risk Group of Obstructive Sleep Apnea Among Western Region Population in Saudi Arabia. The Egyptian Journal of Hospital Medicine, 70(6) :1035-1038.
19. **Alruwaili H, Fateni A and AlOtaibi K(2015)**:Symptoms and risk for obstructive sleep apnea among sample of Saudi Arabian adults. Sleep Bio Rhythms., 13(4):332-41
20. **Al-Jewair M and Thikriat S(2018)**:Prevalence and Risks of Habitual Snoring and Obstructive Sleep Apnea Symptoms in Adult Dental Patients. Saudi Medical Journal, 37(2) : 183–190.
21. **Reisi M (2017)**:Academic Performance, Sleep Disorders and Their Association in Middle School Students in Iran. Int J Pediatr., 5(3): 4541-4549.
22. **Wosu H, Adaeze C (2014)**:The Relationship between High Risk for Obstructive Sleep Apnea and General and Central Obesity: Findings from a Sample of Chilean College Students. ISRN Obesity, 2014, 871681. <http://doi.org/10.1155/2014/871681>
23. **Kleisiaris CF, Maniou M, Papathanasiou I, Tsioliti G, Spitalioraki E, Sarafis P(2014)**: The prevalence of Obstructive Sleep Apnea in Greek young adults in primary care. Health Science Journal, 8(4).

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