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THE RELATIONSHIP BETWEEN OBSTRUCTIVE SLEEP APNEA AND LEVELS OF DEPRESSION AND ANXIETY IN YOUNG ADULTS

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ABSTRACT

Background: Obstructive sleep apnea (OSA) is one of the most common and serious sleep disorders that can cause various neurocognitive disorders such as depression and anxiety. OSA can occur in young adults, who are at an important developmental age in human life. The relationship between OSA and levels of depression and anxiety has never been studied in young adults, especially college students. Early identification and treatment are expected to have an impact on better quality of life and productivity.
Objective: To determine the relationship of OSA with levels of depression and anxiety in young adults
Methods: An observational study with a cross-sectional design. Data were obtained from the Berlin questionnaire, Zung Self-Rating Depression Scale, and Zung Self-Rating Anxiety Scale which was filled out in September-November 2021. Bivariate analysis of OSA's relationship with depression and OSA with anxiety was tested using the chi-square test. Multivariate logistic regression analysis was performed to test for confounding variables.
Results: There was a significant relationship between OSA and depression (p=0,000, OR 4.07) and OSA and anxiety (p=0,000, OR 4.5) in young adults. Logistic regression analysis showed that gender was a confounding variable of anxiety (p=0.044) in young adults. There is a significant relationship between OSA and levels of depression and anxiety in young adults. Young adults who have OSA are 4.07 times more likely to be depressed than young adults who don't have OSA. Young adults who have OSA are 4.5 times more likely to experience anxiety than young adults who don't have OSA
Conclusion:. There is a significant relationship between OSA and the level of anxiety controlled by the confounding variable, namely gender.

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1. Introduction

Obstructive sleep apnea (OSA) is characterized by repeated episodes of upper airway obstruction during sleep.[1]This breathing disorder manifests as snoring, choking, or gasping during sleep at night. The prevalence of OSA in adults reaches 33% in men and 19% in women. In the elderly, OSA reaches 78% in women and 90% in men.[2] The incidence of OSA in young adults is lower at around 14.9% in women and 26.9% in men and even lower in children and adolescents. [3] However, OSA in young adults is asymptomatic or mild so it is not diagnosed until old age. [3] This proves that the incidence of OSA increases with age. [4]

The relationship between OSA and depression can be seen from the similarity of symptoms and the prevalence of its occurrence. The prevalence of depression in OSA sufferers is about 7% to 63% in the general population.[5] Symptoms of depression in OSA sufferers can be reduced after OSA is treated intensively.[6] This may occur because hypoxia in OSA can cause brain nerve cell damage and can cause emotional changes in a person. Disturbed sleep due to OSA can also cause changes in brain activity that affect a person's mood and affect, as improving sleep quality in OSA sufferers can reduce symptoms of depression.[7]

The relationship between levels of anxiety and OSA is not fully understood, although there is a fairly high prevalence ranging from 11% to 70%. [8] Several studies have suggested a two-way relationship between anxiety and OSA, where lack of sleep or poor sleep quality can lead to anxiety as well as otherwise. [9]

An epidemiological study showed that psychiatric disorders such as depression and anxiety had the highest prevalence in the 18-29year age

range, which was around 40%. In 2020, the rate of depression in young adults aged 18-25 years increased from 8.1% to 13.2%.[10] This is higher than that of the children and adolescents age group, whereas in the group of children and adolescents the depression rate is around 4-11%. High rates of depression in young adults have many effects ranging from hindering optimal performance in the office to leading to suicide. In addition, in a case-control study, it was found that the level of undetectable OSA in people with depression was higher than in people without depression. [11]

Therefore, knowing the relationship between OSA and levels of depression and anxiety in young adults can provide an opportunity for early identification and treatment which has a better impact on quality of life and increased productivity. [3] Based on the statements above, researchers are interested in examining the relationship between levels of depression and anxiety with OSA in young adults.

2. Methods

This study is an observational study with a cross-sectional design which was conducted in October-November 2021. The inclusion criteria for this study were that the subject had an age range of 18-25 years and was willing to be a respondent in the study. Exclusion criteria in this study were having DM, hypertension, asthma, heart disease, cancer, pulmonary TB, Parkinson's disease, epilepsy, head trauma or HIV, taking drugs, drinking alcohol in the last 3 months, and being married.

Research subjects were selected through a consecutive sampling method via a google form. The sampling results showed that 179 research subjects met the inclusion criteria and did not meet the exclusion criteria. All data used are primary data derived from filling out online questionnaires by subjects.

The independent variables of this study were depression and anxiety. Depression was evaluated using the Zung Self Rating Depression Scale questionnaire. The degree of depression was categorized into non-depression (score <50) and depression (score ≥50). Anxiety was evaluated using the Zung Self Rating Anxiety Scale questionnaire. The degree of anxiety was categorized into non-anxious (score <45) and anxious (score ≥45). The confounding variables in this study were socioeconomic level, gender, and obesity. The dependent variable in this study was symptoms of obstructive sleep apnea which were evaluated using the Berlin questionnaire. The degree of OSA was categorized into "OSA risk" and "No OSA risk". "OSA risk" consists of low-risk OSA (positive in 1 category) and high-risk OSA (positive in 2 categories or more), while "No OSA risk" consists of no OSA risk (no positive categories). This was done based on the prevalence of OSA in young adults which is lower than in adults or in the elderly and the risk of OSA which increases with age. [3,4]

Data analysis was performed with SPSS computer statistical software. Nominal scale data is presented in the form of a frequency distribution table. Bivariate analysis was carried out using the chi-square test, if the chi-square test conditions were not met, the Fisher exact test was used. The confidence interval used is 95% and the p-value is considered significant if $p<0.05$. Multivariate logistic regression analysis was performed to test for confounding variables.

3. Results

This study involved 179 young adults with an age range of 18-25 years. Subjects who had OSA symptoms were 88 people (49.2%) and subjects who did not have OSA symptoms were 91 people (50.8%). Characteristics of research subjects can be seen in table 1.

The relationship between OSA and levels of depression and anxiety was analyzed by using the chi-square test, which is presented in Tables 2 and 3. In the chi-square test, the values of $p=0.000$ and $p=0.000$ for depression and anxiety in young adults were obtained. This indicates that there is a significant relationship ($p<0.05$) between OSA and depression and anxiety in young adults.

Bivariate analysis results show that each confounding variables have a p-value of 0.05. This means that there is no significant relationship between gender, obesity, monthly income with depression, or anxiety.

Logistic regression analysis was performed on the variables from the bivariate analysis which had a p-value of <0.25 to determine the effect of confounding variables on depression and anxiety. The results of the bivariate analysis showed that monthly income and OSA were eligible to be included in the logistic regression analysis of depression, while gender and OSA were eligible to be included in the logistic regression analysis of anxiety.

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Table 1. Characteristics of research subjects

Category	OSA		Non-OSA		Total
	n	%	n	%	N
Total subjects	88	49.2	91	50.8	179
Depression					
Depressed	31	17.3	11	6.1	42
Non Depressed	57	31.8	80	44.7	137
Anxiety					
Anxious	32	17.9	12	6.7	44
Non Anxious	56	31.3	79	44.1	135
Gender					
Female	55	30.7	75	41.9	130
Male	33	18.4	16	8.9	49
BMI					
Obese BMI (IMT≥25)	47	26.2	0	0	47
Normal BMI (IMT<25)	41	22.9	91	50.8	132
Monthly income					
Income < Rp 1.789.979	45	25.1	48	26.8	93
Income ≥ Rp 1.789.979	43	24	43	24	86

Logistic regression analysis between OSA, monthly income, and depression can be seen in table 4. The results show that OSA is a significant independent factor for depression (p=0.000) and causes depression by 4.07 times compared to those without OSA.

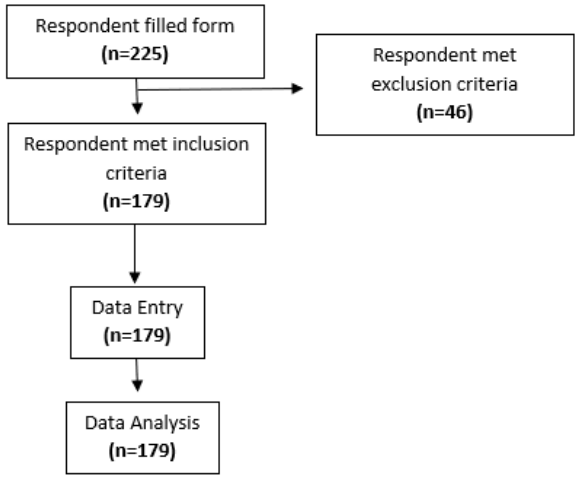

Figure 1. Research flow chart

Logistic regression analysis between OSA, gender, and anxiety can be seen in table 5. The results show that OSA and gender have a significant relationship with anxiety, but OSA has a higher OR. This shows that young adults who have OSA are 4.5 times more likely to experience anxiety (overestimate) compared to young adults who don't have OSA controlled by the confounding variable, namely gender.

Table 2. Relationship between OSA and depression

	Depressed	Non Depressed	*p*
OSA	31	57	0.000*
Non OSA	11	80	

Table 3. Relationship between OSA and anxiety

	Anxious	Non-anxious	*p*
OSA	32	56	0.000*
Non OSA	12	79	

4. Discussion

The results of this study indicate that there is a significant relationship between OSA and depression (p=0.000) and anxiety (p=0.000). The number of OSA subjects who experienced depression was 31 people out of a total of 88 subjects (35.2%), while those who experienced anxiety were 32 people out of a total of 88 subjects (36.4%). Young adults with OSA have a 4.07 times greater risk of developing depression than young adults without OSA. Young adults with OSA have a 4.5 times greater risk of developing anxiety than young adults without OSA. These results are consistent with the results in the research of Park Kyumyoung et al which showed that OSA subjects had higher levels of depression and anxiety than non-OSA subjects. [12]

The main mechanism underlying the occurrence of depression and anxiety in patients with OSA are intermittent hypoxia and disturbances in the quality and quantity of sleep. The first mechanism is intermittent hypoxia. Hypoxia can lead to the accumulation of ROS and disruption of oxygen supply to the brain. This can cause disturbances in the brain's neurotransmitter systems and cause mood disorders. [13,14] The second mechanism is the disruption of the quality and quantity of sleep. Sleep fragmentation and sleep debt in patients with OSA can interfere with the body's repair and physiological regeneration during sleep, causing the accumulation of stress in the body. Chronic stress that occurs can cause various changes in the brain and lead to mood disorders, such as depression and anxiety. [15,16]

Other factors analyzed in this study as confounding variables suspected of influencing the risk of OSA, depression, and anxiety levels were gender, obesity, and monthly income. This study

did not find any relationship between the three confounding variables with depression, however, that is not the case for anxiety.

This study found that there was a significant relationship between the gender variable and the level of anxiety. It can be stated that OSA is significantly related to anxiety controlled by the confounding variable, namely gender. Women have a 2 times higher risk of anxiety than men. Liisa et al, in their research, showed that anxiety in women often appears or worsens when hormonal fluctuations occur. At productive age, 80% of women experience at least one physical symptom, mood, or anxiety, especially during the luteal phase of the menstrual cycle. [17,18]

There are several limitations to this research. First, the OSA assessment is only using the Berlin questionnaire. A better OSA assessment is an assessment using the gold standard for OSA which is polysomnography, combined with history taking or OSA questionnaires. Second, In this study, the socioeconomic assessment is only based on income per month. Better assessments for socioeconomic as a risk factor for depression and anxiety are monthly income and subjective socioeconomic assessment.

Table 4. Confounding factors that affect depression analysis

Variable	Multivariate analysis							
	Depressed		Non Depressed		OR	*P*	CI 95%	
	N	%	N	%			Min	Max
OSA category								
OSA	31	73.8	57	41.6	4.074	0.000*	1.878	8.837
Non OSA	11	26.2	80	58.4				
Monthly Income								
< Rp 1.798.979	26	28	67	72	1.814	0.113*	0.868	3.791
≥ Rp 1.798.979	16	18.6	70	81.4				

5. Conclusion

Obstructive sleep apnea (OSA) is significantly associated with depression in young adults. Young adults who have OSA are 4.07 times more likely to be depressed than young adults who do not have OSA.

Obstructive sleep apnea (OSA) had a significant effect on anxiety in young adults controlled by the confounding variable of gender. Young adults who have OSA are 4.5 times more likely to experience anxiety than young adults who do not have OSA.

Researchers suggest further research using objective diagnostic tools for OSA such as polysomnography combined with subjective assessment such as history taking or OSA questionnaires. Further research using subjective socioeconomic assessment and monthly income to assess individual socioeconomic status as the risk factor for depression and anxiety is needed.

Ethical Approval

This research has obtained ethical approval from the Health Research Ethics Commission, Faculty of Medicine, Diponegoro University, Semarang with the number 387/EC/KEPK/FK-UNDIP/X/2021.

Conflicts of Interest

The authors declare that there was no conflict of interest.

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