

Analysis of Risk Factors Influencing The Incidence of Obstructive Sleep Apnea (OSA) In Elderly Patients In The Berlian Ward Of PHC Hospital Surabaya

Shobihatus Syifak¹, Iis Noventi²

¹Department of Medical Professional Education, Faculty of Medicine, Universitas Nahdlatul Ulama, Surabaya, Indonesia

²Department of Nursing, Faculty of Nursing and midwifery, Universitas Nahdlatul Ulama Surabaya, Surabaya, Indonesia

Corresponding Author: iisnoventi@unusa.ac.id

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Abstract

Introduction: Untreated OSA can lead to long-term health issues such as heart disorders, metabolic system disorders, cognitive impairments, poor sleep quality, nocturia, morning headaches, irritability, and memory disturbances. Obstructive sleep apnea (OSA) is a condition commonly found not only in developed countries but also in developing nations. A study reported that nearly 1 billion people worldwide experience OSA, with moderate to severe OSA affecting 425 million adult patients aged 30–69 years.

Objective: To analyze the risk factors for the incidence of Obstructive Sleep Apnea (OSA) in elderly patients at PHC Hospital Surabaya.

Methodology: This study is a quantitative research with a descriptive method using a cross-sectional approach. The sample in this study consists of 30 OSA patients who underwent polysomnography at PHC Hospital Surabaya. The sample includes OSA patients aged 50-65 years who underwent polysomnography at PHC Hospital Surabaya. Data collection was carried out using the Berlin questionnaire and polysomnography examination. Based on the Chi Square test results using SPSS with a significance level $\alpha = 0.05$, the obtained p-value was $p = 0.000$. Therefore, since $p < \alpha$, H_0 is rejected, indicating that sleeping position factors influence the incidence of OSA in adult patients at PHC Hospital Surabaya.

Findings: This study shows that the majority of respondents with obesity and supine sleeping position are risk factors influencing the incidence of obstructive sleep apnea (OSA).

Keywords: *Elderly*¹, *Obesity*², *OSA*³, *Supine Sleeping Position*⁴.

1. Introduction

In patients with Obstructive Sleep Apnea (OSA), a person will stop breathing during sleep due to the closure of the upper airway caused by inadequate muscle tone in the tongue and dilator muscles. Breathing and sleeping are basic physiological processes in human daily life. If breathing stops for a few minutes, human life can also cease. Sleep is another part of this basic physiological process, and disturbances in sleep can lead to a decline in quality of life. Unmet sleep needs will cause drowsiness the next day, which is a contributing factor to accidents, falls, reduced stamina, and economically decreasing a person's productivity because drowsy people will experience disorientation to their surroundings.

Moreover, drowsiness can lead to difficulty concentrating and feeling tired, making them more inclined to rest rather than work (Paramurthi et al., 2021). OSA symptoms are common but difficult to detect. One frequently experienced symptom is snoring; most OSA sufferers report that their bed partners often complain about the loud snoring and breathing pauses during sleep, which cause the patient to wake up frequently. Although the duration of sleep is quite long, OSA sufferers often complain of drowsiness upon waking due to poor sleep quality. Untreated OSA can result in long-term health problems such as heart disorders, metabolic system disorders, cognitive impairments, poor sleep quality, nocturia, morning headaches, irritability, and memory disturbances. Furthermore, sleep apnea significantly increases daytime sleepiness, leading to a tendency to fall asleep, decreased alertness and vigilance, slower reaction times, and reduced psychomotor coordination. This condition ultimately increases the risk of accidents.

Prevalence data on OSA in the Indonesian population varies. A study by Susanto et al. found that 52.5% of taxi drivers tested positive for OSA through polysomnography. Research by Agus Susanto et al. using the Berlin questionnaire showed that 17.2% (16 out of 93) of traffic police officers were likely to have OSA. The prevalence of possible OSA among police officers is related to a family history of snoring. One study reported 24% in men and 9% in women. Several cohort studies indicate that with obesity, defined as a Body Mass Index (BMI) of 25-28 (moderately overweight), approximately 1 in 5 men will experience severe OSA, while moderate OSA affects 1 in 15 men (Bahagia & Ayu, 2020). OSA is found in at least 50% of the elderly population. Using the OSA definition that includes hypopnea with 3% desaturation, it can affect up to 75% of individuals over 65 years old.

In OSA cases, several risk factors influence and exacerbate the occurrence of OSA, including anatomical abnormalities, age, gender, obesity, smoking habits, alcohol consumption, sleeping position, neck circumference, and family history of snoring. Obesity can increase the risk of obstructive sleep apnea due to airway obstruction caused by adipose tissue deposits. Obesity affects neck circumference, which tends to be larger than in individuals with an ideal body weight. Obesity carries a high risk of hypertension, hyperlipidemia, and elevated pro-inflammatory agents. Besides obesity, the relationship between smoking and obstructive sleep apnea has been found in several studies. The effects of smoking on the pathophysiology of obstructive sleep apnea include upper airway inflammation caused by smoking and the stimulant effects of nicotine on the upper airway muscles, as well as a "rebound effect" from short-term nicotine cessation at night. Thus, smoking cessation strategies are necessary to prevent or reduce obstructive sleep apnea. Alcohol can also relax the muscles in the throat, which can worsen obstructive sleep apnea (Suryoadji, 2021). In OSA patients, a family history of snoring may indicate a possible genetic factor in habitual snoring. The supine sleeping position is associated with increased apnea or hypopnea episodes and the severity of oxygen desaturation. This occurs due to the influence of gravity and changes in the size and position of the upper airway, which can exacerbate OSA symptoms (Bahagia & Ayu, 2020). OSA often goes undetected because it occurs while the patient is sleeping. Therefore, efforts need to be made, such as maintaining a body mass index below 25 kg/m², engaging in optimal physical activity with 150 minutes of aerobic exercise per week, and avoiding smoking and alcohol consumption to prevent obstructive sleep apnea. Understanding these factors can help reduce the risk of obstructive sleep apnea and other related diseases (Suryoadji, 2021). Based on these findings, the researcher will conduct a study on the analysis of factors influencing the incidence of Obstructive Sleep Apnea (OSA) in elderly patients.

2. **Materials and methods**

2.1 *Materials*

1. Type of Research

This research is a quantitative study using a descriptive method with a cross-sectional approach.

2. Time and Place of Research

This research will be conducted starting in March 2024, with data collection through questionnaires carried out in the last week of April 2024. The research will be conducted at PHC Hospital Surabaya.

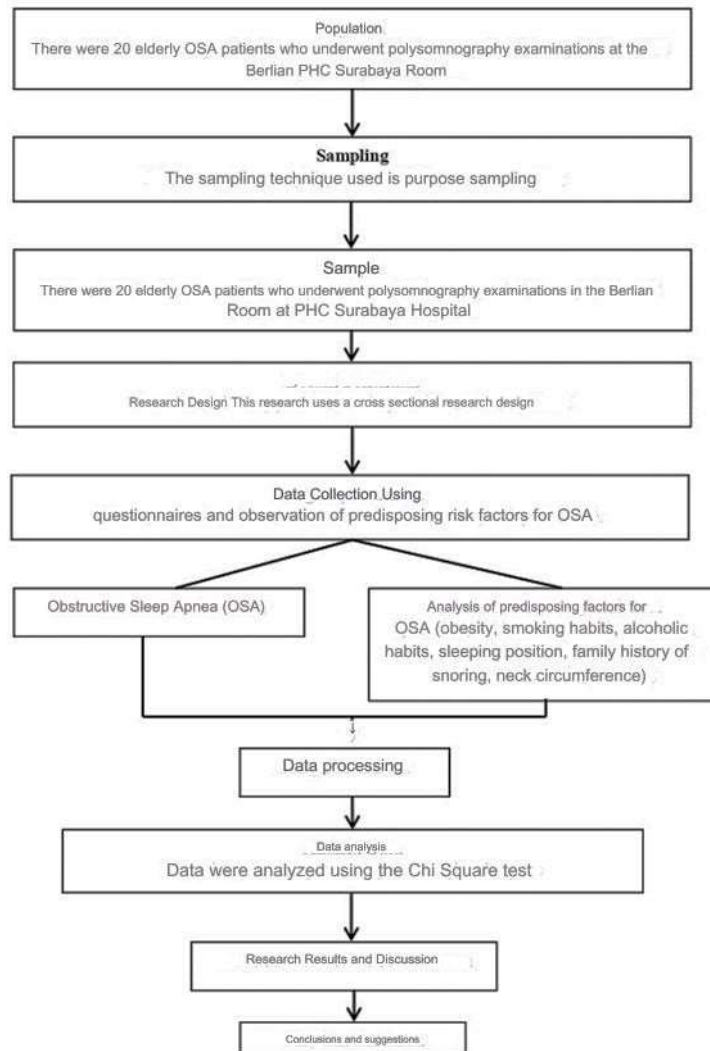
3. Population, Sample, and Sampling

The population in this study consists of OSA patients who underwent polysomnography in the Berlian Ward of PHC Hospital Surabaya. The sample taken includes OSA patients aged 50-75 years who underwent polysomnography in the Berlian Ward of PHC Hospital Surabaya. The total number of samples used for this study is 20 patients. The sampling technique used in this research is purposive sampling, which divides the population based on the inclusion criteria set for OSA patients.

4. Research Variables

Smoking habits, alcohol consumption habits, sleeping position, family history of snoring, and neck circumference.

2.2 Data collection procedures



2.3 Data analysis

The data analysis used includes the chi-square test and the assistance of the SPSS 25 for Windows program with a significance level of $\alpha = 0.05$

3. Results and discussion

3.1 Results and discussion

The researcher received complete questionnaires from 30 patients. The results of the polysomnography examination indicated that the patients had a history of snoring during sleep, showing early signs of OSA.

Table 1. Frequency Distribution of Respondents' Characteristics Based on Obesity Factors in Adult

Patients at PHC Hospital Surabaya.

IMT	Frequency	Percentage
< 25 Kg	8	26,7
> 25 Kg	22	73,3
Total	30	100

Based on Table 1, the research results showed that 8 patients (26.7%) had a BMI < 25 kg/m², and 22 patients (73.3%) had a BMI > 25 kg/m².

Table 2. Frequency Distribution of Respondents' Characteristics Based on Sleeping Position Factors in Adult Patients at PHC Hospital Surabaya

Sleeping Position	Frequency	Percentage
Supine	20	66,7
2 Positions (Supine and Lateral)	10	33,3
Total	30	100

Based on Table 2, the research results showed that 20 patients (66.7%) had a supine sleeping position, and 10 patients (33.3%) had two sleeping positions.

Table 3. Cross Tabulation of Obesity Factors with the Incidence of OSA in Adult Patients at PHC Hospital Surabaya

IMT	Incidence of OSA						Total	Percentage
	Mild		Moderate		Severe			
	N	%	N	%	N	%		
< 25kg/m ²	7	23,3	1	3,3	0	0	8	26,6
> 25kg/m ²	1	3,3	2	6,7	19	63,3	22	73,3
Total	8	26,7	3	10,0	2	63,3	30	100
Chi Square Test Results								<i>P = 0,000</i>

Based on Table 3, the cross-tabulation analysis of obesity factors with the incidence of OSA in adult patients at PHC Hospital Surabaya shows that out of 8 patients with BMI < 25 kg/m², a small portion (23.3%) experienced mild OSA. Meanwhile, out of 22 patients with BMI > 25 kg/m², a majority (63.3%) experienced severe OSA. Based on the Chi Square test results using SPSS with a significance level $\alpha = 0.05$, the obtained p-value was $\rho = 0.000$. Therefore, since $\rho < \alpha$, H₀ is rejected, indicating that obesity factors influence the incidence of OSA in adult patients at PHC Hospital Surabaya.

Table 4. Cross Tabulation Analysis of Sleeping Position Factors with the Incidence of OSA in Adult Patients at PHC Hospital Surabaya

Sleeping Position	Incidence of OSA			Total	Percentage
	Mild	Moderate	Severe		

	N	%	N	%	N	%			
Supine	1	3,3	0	0	19	63,3	20	66,6	
2 Positions (Supine and Lateral)	7	23,3	3	10,0	0	0	10	33,3	
Total	8	26,7	3	10,0	19	63,3	30	100	
Chi Square Test Results								<i>P=0,000</i>	

Based on Table 4, the cross-tabulation analysis of sleeping position factors with the incidence of OSA in adult patients at PHC Hospital Surabaya shows that out of 20 patients with a supine sleeping position, the majority (63.3%) experienced severe OSA. Meanwhile, out of 10 patients with a non-supine sleeping position, a small portion (23.3%) experienced mild OSA. Based on the Chi Square test results using SPSS with a significance level $\alpha = 0.05$, the obtained p-value was $p = 0.000$. Therefore, since $p < \alpha$, H_0 is rejected, indicating that sleeping position factors influence the incidence of OSA in adult patients at PHC Hospital Surabaya.

3.2 Results and discussion

Obesity Factor

Based on the research results, it shows that out of 30 respondents, the majority (73.3%) have a body mass index (BMI) $> 25 \text{ kg/m}^2$, which falls into the obese category. Obesity is associated with anatomical changes that predispose upper airway obstruction during sleep. These changes arise from adiposity around the pharynx and torso as follows. First, increased neck circumference and fat deposits around the upper airway in obesity can narrow the upper airway. Second, collapsibility of the upper airway is higher in obesity compared to non-obese individuals and does not decrease appropriately when the pharynx widens by advancing the jaw anteriorly. Third, obesity, particularly central obesity, has been linked to decreased lung volume, leading to caudal traction loss in the upper airway and increased pharyngeal collapsibility, increasing the need for continuous positive airway pressure and greater severity of sleep apnea (Putri Chairunnisa et al., 2023). Susanto et al., 2016 stated that neck circumference is a strong predictor and a physical examination characteristic in patients with OSA. Neck circumference is the measurement around the neck passing above the cricothyroid membrane measured in a standing position. Their study reported that neck circumference ($>40 \text{ cm}$) is associated with an increased pnea-Hypopnea Index (AHI).

Sleeping Position Factor

Based on the research results, it shows that out of 30 respondents, the majority (66.7%) sleep and snore in the supine position. Incorrect sleeping positions can exacerbate respiratory system health conditions. There is even a possibility of upper airway closure during sleep due to improper positioning. In OSA patients, supine or spine sleeping positions are associated with increased episodes of apnea or hypopnea and severity of oxygen desaturation. This occurs due to gravitational effects and changes in the size and position of the upper airway (Bahagia & Ayu, 2020). Optimal modification of physical activities can reduce the risk of obstructive sleep

apnea by increasing the tone of upper airway dilator muscles. With continuous improvement in the tone of upper airway dilator muscles, there will be an increase in the diameter of the upper airway. This increased diameter reduces airway resistance and the risk of pharyngeal collapse during sleep, which is

the basis for obstructive sleep apnea (Suryoadji, 2021).

Analysis of Obesity Factor with the Incidence of OSA

Based on the Chi Square test results using SPSS with a significance level $\alpha = 0.05$, and obtaining a p-value of $\rho = 0.000$, since $\rho < \alpha$, H_0 is rejected, indicating that obesity factors influence the incidence of OSA in adult patients at PHC Hospital Surabaya.

Obesity increases the risk of obstructive sleep apnea due to airway obstruction caused by adipose tissue deposits. Excessive obstructive sleep apnea further reduces respiratory ventilation stability (Putri Chairunnisa, 2023).

Analysis of Sleeping Position Factor with the Incidence of OSA

Based on the Chi Square test results using SPSS with a significance level $\alpha = 0.05$, and obtaining a p-value of $\rho = 0.000$, since $\rho < \alpha$, H_0 is rejected, indicating that sleeping position factors influence the incidence of OSA in adult patients at PHC Hospital Surabaya. Postural OSA diagnosis is established if obstruction episodes during sleep occur predominantly in the supine position (AHI in the supine position is at least twice as high as in the non-supine position). Most mild to moderate OSA cases are positional OSA (between 65-87%), making positional therapy a simple, cost-effective, and effective solution to reduce obstruction periods during sleep (Bahagia & Ayu, 2020).

4. Conclusion

The results of this study indicate that obesity and sleeping position factors affect the occurrence of OSA. These findings provide evidence that obesity and sleeping position are risk factors for OSA, so these two things need to be avoided and educated in patients at risk of OSA.

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Conflict of interest

The authors declare that there is no conflict of interest and the final manuscript of this paper has been approved by all authors.

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