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ABSTRACT

Background: The prevalence of preeclampsia is around 5-8% of all diseases that occur during pregnancy. There was an increase from 10.5% of women with OSA in the first trimester to 26.7% in the third trimester. This study aimed to investigate the effect of obstructive sleep apnea on incidence of preeclampsia in pregnant women.
Subjects and Method: A systematic review was conducted by searching the articles from PubMed and Google Scholar databases published between 2015 to 2019. An obstructive sleep apnoea (OSA) analysis was performed. Sensitivity analysis was performed to identify designs, summary results, and publication estimates.
Results: As many as 15 studies with a total of 1,837 subjects were included. OSA during pregnancy was associated with an increased risk of preeclampsia. The selected studies were conducted in observational designs. The existing studies showed that maternal OSA was significantly associated with preeclampsia (aOR= 1.96; 95% CI= 1.30 to 2.42).
Conclusion: There is the adverse relationship of OSA and Preeclampsia. OSA increases the risk of multiple pregnancy and perinatal complications.

Keywords: Preeclampsia, OSA, pregnancy

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BACKGROUND

Prevalence of Preeclampsia is about 5-8% of all diseases that occur during pregnancy (Gathiram and Moodley, 2016). Preeclampsia is the leading cause of perinatal and maternal mortality globally, with about 50,000 - 60,000 deaths each year. Preeclampsia more common in low-income countries than in high-income countries (Payne et al., 2019). A systematic review study conducted by WHO, of 129 studies involving about 39 million women from 40 countries in 2002-2010, found that preeclampsia incidence amounted to around 2.3% (Payne et al., 2016).

Anatomical narrowing and increased resistance in the respiratory system can occur because increased estrogen and progesterone levels cause capillary swelling, hypersecretion, and upper airway mucosal edema. Pregnancy causes anatomi-cal, physiological, and endocrine changes, including narrowing of the upper airway. The incidence of OSA and intermittent hypoxia (Antariksa, 2017). The pathophysiology links intermittent hypoxia, discomfort after sleep, sympathetic activation, and hypertension with OSA leading to gestational hypertension. In a normal preg-

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nancy, Angiotensin II is destroyed by the enplacenta. The vascular system becomes a disruptor to causative factors such as angiotensin II by increasing the synthesis of prostaglandins and nitric oxide, which act as vasodilators (Owusu et al., 2013; McCharthy and Maine, 1992).

There is a narrowing of the anatomy and increased resistance in pregnant women's respiratory system because increased estrogen and progesterone levels induce capillary swelling, hypersecretion, and edema of the upper airway mucosa (Treadway et al., 2009). A combination of the hormone estrogen, placental growth increases circulating blood volume in pregnancy and induces hyperemia, mucosal edema, hypersecretion, and increased upper airways (Brawn et al., 2018). This systematic review aimed to investigate the effect of obstructive sleep apnea on the incidence of preeclampsia in pregnant women.

SUBJECTS AND METHOD

1. Study Design

A systematic review was conducted by searching the articles from PubMed and Google Scholar databases published between 2015 to 2019.

2. Inclusion and Exclusion Criteria

The study included were using analysis of the influence of OSA, with objective measures determining OSA status (either la-boratory polysomnography, home sleep testing, or ICD codes). The study excluded were symptom-based questionnaires, which some studies had shown to be unreliable in pregnant women.

3. Data Analysis

Sensitivity analysis was performed to identify designs, summary results, and publication estimates.

RESULTS

Table 1 showed a summary of examining the influence between maternal OSA and Preeclampsia. Preeclampsia shared the same risk factors as OSA, making it difficult to explore possible relationships (Brawn, 2018) between these diseases. A systematic retrospective review, including a cohort study, reported a two-fold increase in preeclampsia among women with OSA (adjusted), 95% CI 1.60–3.09). Recent case-control studies, objectively assessing OSA, also reported that hypertensive disorders (chronic hypertension, gestational hypertension, and eclampsia) and frequent snoring are associated with OSA in pregnancy.

However, data from the prospective observational cohort are conflicting. A study by Owusu et al. (2013) found that new-onset snoring during pregnancy, but not chronic snoring, was independently associated with gestational hypertension (OR= 2.40; 95% CI 1.50 to 3.80) and Preeclampsia (OR= 1.60; 95% CI= 1.10 to 2.40) after adjusting for known risk factors in the largest longitudinal study of 1,700 pregnant women. The largest cohort of study of 791 women with OSA diagnosed with PSG reported that women with OSA diagnosed before pregnancy had an increased risk of eclampsia (aOR= 1.60; 95% CI 2.16 to 11.26), compared with women without an OSA diagnosis.

The effect of obesity was not fully controlled, but the reported obesity rate was only 1.6% in the 2007 Taiwan population. In contrast, two prospective studies using PSG diagnostic and portable diagnostic devices did not confirm an association between Preeclampsia (Burton et al., 2019).

DISCUSSION

OSA and increased risk of gestational hypertension show the hemodynamic effect of OSA in pregnancy, 10 pregnant women with OSA who had no evidence of hypertension, and 10 women with OSA and Preeclampsia (Akbar, 2019).

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Table 1. Summary of examining the influence between maternal OSA and Preeclampsia

No	Author (year)	OR	95% CI	
			Upper Limit	Lower Limit
1	Champaqne, K, et.al (2009)	5.60	1.40	23.20
2	louis, K Judette, et.al (2018)	8.60	66	95
3	Ursavas, ahmed, et.al (2007)	1.49	0.55	4.05
4	Ercan, Ilker, et al. (2017)	1.65	0.56	4.83
5	Obrein, M, et.al (2014)	3.40	2.70	4.30
6	Daniel, et.al (2007)	2.01	1.33	3.06
7	Cornelio, Shanthia, et.al (2016)	2.03	1.01	4.10
8	Facco, L francesca , et.al (2018)	1.94	1.18	3.51
9	Parker, B Corette, et.al (2016)	1.73	1.19	2.52
10	Jocelynn T. Owusu, et al. (2013)	3.50	1.40	8.50
11	Jennifer E. Dominguez, et.al	1.94	1.07	3.51
12	Obrein, M, Louis et.al (2012)	1.71	1.20	2.44
13	Francesca L. Facco, et.al (2017)	2.58	1.24	5.36
14	Pien, W Graze, et.al (2017)	1.19	1.19	3.12
15	Lungeanu, Laura, et.al (2016)	5.60	1.40	23.2
16	Champagne. Et.al (2009)	1.86	1.30	2.42
17	Fung, AM, et.al. (2012)	2.60	1.02	6.60

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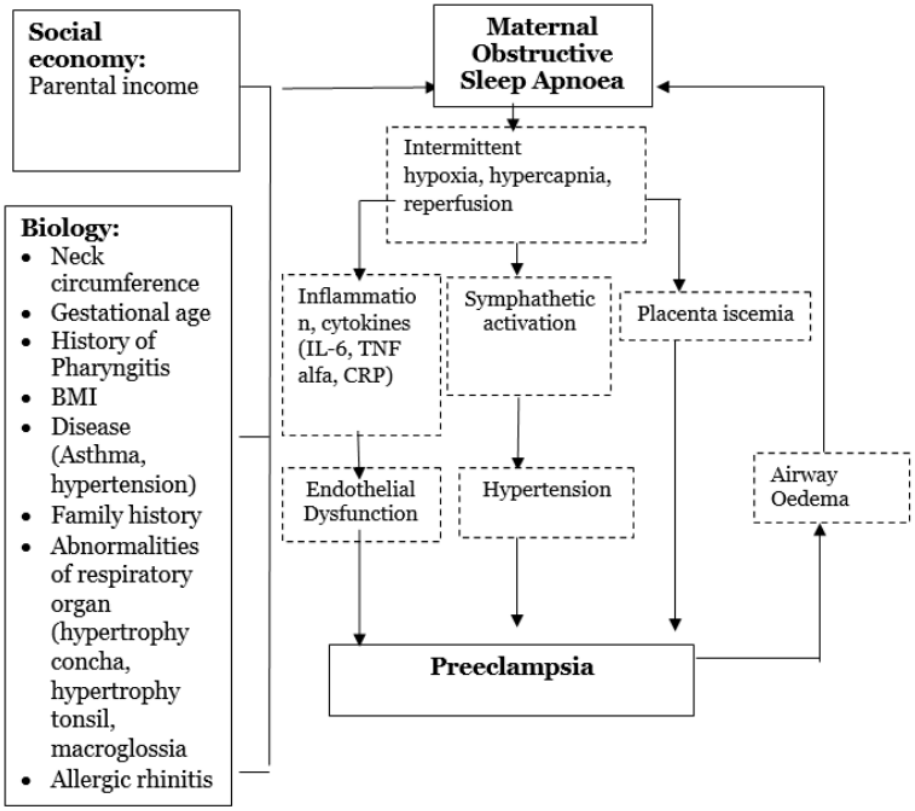

Figure 1. Factors associated with preeclampsia

They found that in the group of patients with OSA and Preeclampsia, blood pressure increased after upper airway occlusion showed increased responsiveness during rapid eye movement (REM) and non-REM sleep (Burton, 2019).

There was an association between snoring and preeclampsia, rather than between AHI and Preeclampsia and other clinical outcomes of pregnancy. Therefore, it has been recognized that it is not the absence of airflow that is the most important aspect of OSA in pregnant women at risk of Preeclampsia (Facco, 2017), but the potential for flow reduction with increased work breathing. Patients with preeclampsia had a higher mean index when compared with non-preeclamptic female patients from each of the three trimesters of pregnancy and compared with matched nonpregnant female patients.

The graded-index measured the boundary flow of inspiration derived from the relationship between the flow of inspiration and duration of inspiration. Additionally, it could confirm that women with preeclampsia have upper airway narrowing. From the research results, the following theoretical concepts can be made.

Factors associated with OSA are (risk factors Obstruction Sleep Apnea), neck circumference, waist circumference, family history of snoring, obesity, maternal age, neck circumference, family snoring history, maternal age, obesity, past medical history

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(DM, hypertension), occupation, smoking, air temperature, pollutants, history of pharyngitis, negligence of respiratory anatomical structures (hypertrophy of the concha, hypertrophy of tonsils, macroglossia, allergic rhinitis,) in preeclampsia in pregnancy.

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