

Effect of snoring on pregnancy-induced hypertension and feto-maternal outcomes

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Abstract

Objectives/Background: Snoring is a hallmark of Sleep Disordered Breathing (SDB) and is seen more often in pregnancy. This study was conducted to determine the frequency of snoring in pregnancy-induced hypertension and to observe its impact on feto-maternal outcomes.

Participants/Methods: Sixty-five women with preeclampsia and gestational hypertension comprised the study group, whereas 85 normotensive, age, and gestation matched women were the controls. All the subjects were questioned about habitual snoring and they were followed to study their feto-maternal outcomes.

Results and Conclusions: Snoring was seen more frequently in the cases (OR 16.9, 95% CI 6.8-41.7) as compared to controls even after controlling for BMI. The severity of hypertension was more in snorers ($p=0.021$). The adverse pregnancy outcomes were more severe in the snorers in the cases as well as the controls. The fetal outcomes were more severely affected by snoring.

Conclusions: Snoring is more prevalent among women with pregnancy-induced hypertension and is associated with more severe hypertension and adverse outcomes.

Keywords: Preeclampsia, Gestational hypertension, Pregnancy induced hypertension, Snoring, Sleep-disordered breathing, Feto-maternal outcomes.

Introduction

Sleep Disordered Breathing (SDB) is a spectrum of respiratory abnormalities due to the partial or complete collapse of the upper airway during sleep leading to intermittent hypoxia and fragmentation of sleep.

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These disorders are commonly seen in pregnant women, particularly in the 3rd trimester. The increased prevalence of SDB during pregnancy has been attributed to weight gain, narrowing of the upper airway due to pharyngeal edema and increased upper airway resistance¹⁻⁴.

Habitual snoring is considered as the hallmark of SDB. It has been seen that snoring is strongly associated with polysomnographic derived apnea-hypopnea index (AHI) and in women who report snoring as often or usual, it is associated with polysomnography (PSG) confirmed SDB with an OR of 3.8 and 16.3, respectively^{5,6}.

Snoring has been reported to occur more frequently in pregnancy and has been associated with poor pregnancy outcomes like preeclampsia and gestational hypertension⁷⁻¹⁵. Studies from Europe and North America have reported significantly higher rates of snoring in pregnant women as compared to age-matched, non-pregnant women¹⁰⁻¹³. In studies conducted on Indian population, snoring was found in 18-27.5% of pregnant women^{14,15}. It is also to note that snoring is often under-reported in females due to cultural and social factors¹⁶.

SDB is associated with many cardiovascular manifestations including hypertension, coronary artery disease, and strokes¹⁷⁻¹⁹. It has been postulated that repeated episodes of hypoxia and arousal during sleep lead to sympathetic activation, oxidative stress, and endothelial dysfunction which may be responsible for the development of hypertension.

Preeclampsia and gestational hypertension are disorders, which manifest first time during pregnancy and affect about 7-10% of all pregnant women^{20,21}. The pathogenesis of preeclampsia has eluded generations of researchers, but the most accepted mechanism which is described is triggered by the defective trophoblastic invasion of the placenta leading to a cascade of inflammatory changes and endothelial dysfunction²².

Preeclampsia is one of the most important causes of maternal and fetal morbidity and mortality²³. The poor maternal outcomes include, eclampsia, antepartum hemorrhage, postpartum hemorrhage, and induced and operative deliveries, whereas the adverse fetal outcomes are intrauterine growth restriction (IUGR), preterm delivery, low birth weight, and need for nursery admission for the baby²³⁻²⁵.

Recent studies have reported that snoring is seen more commonly in women with preeclampsia²⁶⁻²⁹. Both SDB and preeclampsia have several features in common. The pathogenesis of hypertension in both the conditions is similar and there is overlapping of risk factors. Moreover, both are seen more often with advancing gestational age and are associated with adverse pregnancy outcomes.

There is only scanty evidence regarding the association of snoring with the maternal and fetal outcomes in preeclampsia, even though some studies have seen poor maternal and fetal outcomes in pre-eclamptic women suffering from SDB³⁰. Diagnosis of SDB requires a full night polysomnography which is often difficult to

perform in pre-eclamptic women due to logistic and emergent clinical reasons. Hence, we decided to use snoring as a surrogate marker for SDB. It was hypothesized that snoring would be more prevalent in women with preeclampsia and would be associated with worse maternal and fetal outcomes.

Methods

2.1. Participants

This was a prospective, case-control study which was conducted at Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi. Patients with preeclampsia or gestational hypertension in the age group, 18-35 years, who attended the antenatal OPD or admitted as in-patients were serially screened and those who met the inclusion criteria were offered to be part of the study. Ethical clearance from the institutional ethical committee was taken before commencing the study.

A total of 78 patients fulfilled the criteria and of these 65 gave their consent to be part of the study. The demographic and clinical profile of the women who did not give their consent was similar to that of the others.

Women with chronic or acute respiratory diseases, overt or gestational diabetes, renal disease, liver disease, heart disease, essential hypertension or any other medical or obstetrical condition known to have poor pregnancy outcomes were excluded from the study.

Gestational hypertension was defined as a blood pressure of $\geq 140/90$ mmHg on two or more occasions 6 hours apart, detected first after 20 weeks of pregnancy; whereas preeclampsia was diagnosed when hypertension was accompanied by albuminuria of 1+ or more on dipstick examination.

The control group consisted of age and gestation period matched normotensive pregnant women with no medical disease, attending the antenatal OPD. Out of 104 women who fulfilled the criteria, 85 agreed to be part of the study.

2.2. Subject evaluation

All the women underwent a detailed general physical, systemic, and obstetric examination. The subjects were asked about the presence of habitual snoring, defined as snoring more than 3-4 times a week³¹⁻³². All the cases were administered standard care for preeclampsia and gestational hypertension.

The subjects were kept under follow up and the maternal and fetal outcomes during pregnancy, labor, and the postnatal period were recorded. These maternal and fetal outcomes were- preterm labor, antepartum hemorrhage, postpartum hemorrhage, eclampsia, intrauterine growth restriction, birth weight of neonate, APGAR score, mode and route of delivery, and the requirement for nursery admission.

2.3. Statistical Analysis

Comparison of demographic parameters between cases and controls was done using the student’s t-test and Chi-square test. The comparison was also done after adjustment for the BMI comparison of maternal and fetal complications including BP between snorers and non-snorers in cases and controls separately were done using Chi-square test and student’s t-test.

Results

Table 1: Comparison of demographic parameters and snoring between cases and controls.

Demographic parameters	Cases N=65 (mean ± SD)	Controls N=85 (mean ± SD)	p-value (OR) CI of OR	p-value after adjustment for BMI (OR)(CI of OR)
Age(years)	26.0 ± 3.9	25.3 ± 3.4	0.309	
BMI (kg/m ²)	26.0 ± 2.3	24.7 ± 2.0	0.001	
POG(weeks)	34.0 ± 2.4	34.3 ± 2.7	0.450	
SBP (mm Hg)	144.7 ± 6.6	107.5 ± 6.5	<0.001	0.992
DBP (mm Hg)	94.1 ± 4.4	68.9 ± 6.2	<0.001	0.991
MBP (mm Hg)	110.9 ± 4.6	81.8 ± 5.6	<0.001	0.992
Snoring	67.1 %	10.8 %	<0.001 (OR=16.9) (6.8,41.7)	<0.001 (15.6) (6.0,40.7)

BMI : Body Mass Index; POG : Period of Gestation; SBP : Systolic Blood Pressure; DBP : Diastolic Blood Pressure; MBP: Mean Blood Pressure

It was observed that snoring occurred more frequently in the patients with preeclampsia as compared to the normotensive pregnant women, even after adjustment for BMI (OR 16.9, 95% CI 6.8-41.7). The age and period of gestation in both groups was comparable. The blood pressure values were predictably higher in the cases but interestingly this difference became insignificant on adjusting for BMI, signifying the role of BMI in the development of hypertension (Table 1).

Table 3: Maternal and fetal outcomes in cases and controls.

		Cases n =65		Controls n =85	
		%	p-value	%	p-value
LSCS	Snorers	47.4	0.7	28.6	0.462
	Non-snorers	42.9		17.2	
Spontaneous delivery	Snorers	19.9	0.025	71.4	0.462
	Non-snorers	42.9		82.8	
Induced delivery	Snorers	33.3	0.063		
	Non-snorers	14.3			
IUGR	Snorers	49.1	0.034	71.4	0.001
	Non-snorers	25.0		10.5	
APGAR <=7	Snorers	54.4	0.053	57.1	0.034
	Non-snorers	32.1		17.2	
Birth weight <2.5 kg	Snorers	2.38+ 0.43	0.684	2.44+ 0.98	<0.001
	Non-snorers	2.43+ 0.59		2.76+ 0.30	

LSCS: Lower segment caesarean section; IUGR : Intra-uterine growth restriction

We further decided to study the association of pregnancy outcomes with snoring. It was seen that the snorers consistently fared poorly for induced delivery, intrauterine growth restriction and an APGAR score <7 in the cases. A similar trend was observed for LSCS and birth weight < 2.5 kg though insignificant. Notably, the snorers in the control group also suffered from adverse pregnancy outcomes (Table 3).

Discussion

This was a prospective, case-control study in which it was observed that snoring occurred more frequently in women with new-onset hypertension of pregnancy. This difference remained significant even after controlling for BMI, further strengthening the association of snoring and preeclampsia, as obesity is a common risk factor for both conditions. We also observed that the severity of hypertension was more in the pre-eclamptic women with snoring. Further, on studying the association of pregnancy outcomes with snoring, it was seen that women who snored had significantly higher adverse outcomes as compared to none-snorers in cases as well as the controls.

Snoring is a manifestation of narrowing of the upper airway during sleep, as a result of sleep-specific changes in the function of upper airway or due to a narrower upper airway even in the wakeful state³³. It has been observed by many that pregnant women have a higher prevalence of snoring as compared to their non-pregnant counterparts⁷⁻⁹. This could be because of the anatomical and physiological changes during pregnancy leading to narrowing of the airway¹⁻⁴. These changes may be further accentuated in preeclampsia due to fluid shifts from the lower limbs to the neck area³⁴. Izci et al.,³⁵ noted that the caliber of the upper airway was significantly smaller in the pre-eclamptic pregnant women as compared to normotensive pregnant women and non-pregnant women. The reason for this may be tissue edema, though differential fat deposition also has to be considered. Imaging studies would be useful to determine the nature of the soft tissue deposits in these patients.

We too observed an increased frequency of snoring in preeclampsia, (OR 16.6, $p < 0.001$), even after controlling for obesity, which is one of the major risk factor for snoring and SDB³⁶⁻³⁹. It is possible that the snoring may lead to repeated arousals with resultant surges in the blood pressure leading to an exacerbation of blood pressure in the pre-eclamptic women^{40,41}. This may explain our observation of an increased severity of hypertension in the snorers. Even though the association of snoring with preeclampsia has been well established in our study and by previous authors, it is difficult to determine the directionality of the relationship without interventional studies¹⁰⁻¹⁴. Preliminary reports though suggest an improvement of blood pressure in cases of preeclampsia on nasal C-PAP therapy⁴⁰.

Preeclampsia is known to be associated with poor pregnancy outcomes. To determine whether snoring worsens these outcomes, we studied the relationship between snoring and some maternal and fetal outcomes. Not surprisingly, a significant association was observed between snoring and adverse pregnancy outcomes in the cases. Similar trends were also seen in the control group. However, the exact mechanism responsible for this needs to be further studied with detailed PSG to determine the individual contribution of airflow limitation, gas exchange abnormalities, and sleep fragmentation in the causation of poor pregnancy outcomes.

It was noteworthy that the impact of snoring was more significant for fetal outcomes as compared to maternal outcomes. This may be explained by the

observations of a recent study which found a significant association of maternal snoring with enhanced fetal erythropoiesis⁴². Erythropoiesis occurs during periods of hypoxia and is associated with intrauterine growth restriction⁴³. Thus it appears that adverse fetal outcomes may be more sensitive to snoring with repeated episodes of maternal apnea during snoring may lead to fetal hypoxia.

The strength of our study lies in the prospective design and the fact that we followed the subjects till they delivered, hence defining the outcomes. The major limitation was the use of symptom-based screening rather than a PSG to study the pregnancy outcomes. However, this in itself has got very practical implications. It is logistically difficult to make all pre-eclamptic women undergo a full night, in-lab PSG; using snoring as a surrogate has given us an insight into the contribution of SDB towards poorer outcomes in preeclampsia. Hence, we can recommend that all pregnant women with pregnancy-induced hypertension should be screened for SDB by taking the history of snoring, followed by a full night PSG which can reveal the exact magnitude of the problem. Interventional studies are also warranted to see the impact of C-PAP treatment on maternal and fetal outcomes in preeclampsia.

To summarize it was observed that snoring was seen more frequently in women with preeclampsia. Further, it was seen that the women who snored had more severe hypertension and poorer pregnancy outcomes as compared to women with preeclampsia who did not snore. Hence, it is recommended that all pre-eclamptic women who snore should be evaluated for the presence of SDB by PSG or an equivalent test.

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