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Prevalence of Obstructive Sleep Apnea Among Pregnant Women and Its Association with Pregnancy Outcomes

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ABSTRACT

Background & Objective: Obstructive sleep apnoea (OSA) is characterised by repeated episodes of upper airway obstruction resulting in hypoxemia, hypercapnia and sleep fragmentation. It is intriguing to consider the consequences of these events on pregnancy outcomes. This study was conducted to determine the prevalence of obstructive sleep apnoea among pregnant women and its association with pregnancy outcomes.

Materials & Methods: It has been found that subjects belonging to the age group 21-25 years had increased sleep disturbances and reduced quality of sleep. Also, pregnant women in the first trimester were found to have poor quality sleep.

Results: Pregnancy outcomes associated with OSA were found as high chance of caesarean section, gestational diabetes mellitus, Gestational hypertension, low birth weight and APGAR<7.

Conclusion: Hence, early detection and its prevention can improve the pregnancy outcomes.

Keywords: Obstructive Sleep Apnoea, Sleep-disordered Breathing, Gestational Diabetes Mellitus

Introduction

The majority of women experience sleep alterations during pregnancy **(1)**. Physiological changes in pregnancy are frequently associated with changes in sleep pattern and duration which are frequently reported as sleep complaints. Physiological and biochemical changes during pregnancy can be a risk factor for causing sleep disorders such as restless legs syndrome (RLS) and obstructive sleep apnoea (OSA) **(1)**. Quality of sleep is important both for the mother and fetus during pregnancy. Lack of sleep and those sleepless nights can end up with fatigue and daytime sleepiness. Sleep has a bigger role in memory capacity, learning, appetite, mood and decision-making. The growing trend of demands and opportunities of our m odern society makes adequate sleep the least on the priority list for those who try to balance work and family life. Breathing-pauses, micro-arousals, and hemodynamic changes are all early signs of sleep - disordered breathing (SDB). The SDB -related symptoms are common in pregnant women and can be due to physiological changes like weight gain, airway edema and hormonal changes seen in pregnancy.

Some commonly seen sleep disorders are sleep disordered breathing, insomnia, restless legs syndrome and snoring **(1)**. Poor sleep quality in pregnancy has a high prevalence. Around 75% of antenatal women have experienced some form of sleep disturbances **(2)**. There is scarce data on sleep disorders in the Asian antenatal population, particularly the Indian subset. A small number of Asian studies show that snoring and OSA in pregnant women is highly prevalent **(3)**. Seven to eight hours of sleep per 24hrs for adults has been recommended by the National sleep foundation **(4)**. As per Facco et al., mean sleep duration during pregnancy is significantly shorter compared with pre-pregnancy (7.4 hours +/ -1.2 vs 7.0 hours +/ -1.3; P. value =.001) **(5)**. Poor sleep might be linked to the development of GDM, PIH, excessive pregnancy-associated weight gain, caesarean delivery and low birth weight **(6-8)**.
This current study was carried out to look for associati on between obstructive sleep apnea and adverse pregnancy outcomes so that early treatment can have benefits both for mother and fetus.

Methods

Pregnant women attending antenatal clinic in the first trimester were screened for sleep disturbances and then followed till delivery. Totally 167 women were enrolled in the study of which 17 women were lost in follow up hence result were analysed for (n) = 150 patients in the Outpatient clinic Department of obstetrics and gynecology, Sree Balaji Medical College and Hospital, Chennai.

Inclusion criteria

- Booked antenatal cases.
- Primi and multiparous.
- Age group 19 years – 40 years.
- First trimester pregnancy (6 -8 weeks).
- Confirmed single intrauterine live pregnancy.
- Serology negative.
- Antenatal women with no comorbidities.

Exclusion criteria

- Age below 19 years and above 40 yrs
- Multiple pregnancy
- IVF pregnancies
- GDM (Gestational diabetes mellitus) in previous pregnancy
- PIH (pregnancy induced hypertension in previous pregnancy)
- Pre -eclampsia in previous pregnancy
- Cesarean in previous pregnancy
- Family history of hypertension and diabetes mellitus
- Serology positive patients – HIV, VDRL, HbsAg
- Systemic diseases like Cardiac disease, Pulmonary, Hepatic, neurological, psychiatric and malignant disease
- Antenatal women not willing to participate in the study were also excluded

Permission from the Institutional Ethics Committee (IEC) was obtained, and the study was conducted. Antenatal women who fulfilled the inclusion criteria, were explained in their local language about the study purpose and procedure. Written informed consent was obtained from the patients. All the patients were screened by demographic data, detailed medical history, clinical examination and relevant investigations including ultrasonography. Participants were enrolled after fulfilling the inclusion and exclusion criteria. All the subjects were interviewed regarding age, education, occupation, gestational age, parity, obstetric score, obstetric history, past history, personal history, family history and treatment history.

The participants visiting the antenatal clinic for confirmation of pregnancy (6 -8 weeks) were asked to fill the MBQ questionnaire and Performa that assess their sociodemographic parameters. In their following visits at 11--12weeks (first trimester), 24 -28 weeks (2nd trimester) and 34 -36 weeks (third trimester) the participants were given the Proforma to assess the sleep quality, after delivery each participant was assessed for any adverse pregnancy outcomes such as caesarean delivery, low birth weight, APGAR score <7 and NICU admissions. MBQ > 2 were taken as significant.

Risk categorization

According to modified Berlin questionnaire and risk categorization the pregnant women were classified into significant risk for OSA and non-significant risk for OSA categories.

The responses for the three symptom categories were divided as high-risk symptoms and low risk symptoms. 1 point was given for high-risk symptoms in each category.

Please refer to Table 1 for high-risk symptoms in each category.

Table 1. Table showing high risk symptoms in all three categories of modified Berlin Questionnaire

Category	High risk symptoms for OSA
Category1	Persistent symptoms (>3 to 4 times/wk) in two or more questions about their snoring
Category2	Persistent symptoms (>3 to times/wk) in two or more questions about their wake time sleepiness
Category3	History of high blood pressure as per the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC VI) or body mass index (BMI)>25 kg/m

Patients with high-risk symptoms in at least two categories are said to have significant risk for OSA and those who have high risk symptoms restricted to only one category or who did not have persistent symptoms were classified as non-significant risk for OSA group,

The collected data were analysed with IBM SPSS statistics for Windows Version 23.0 (SPSS software, version 23.0, IBM corp., Armonk, NY, USA). To describe the data, descriptive statistics such as frequency analysis and percentage analysis were used for categorical variables, while the mean and standard deviation were used for continuous variables. The Chi-Square test was used to determine the significance of categorical data. The probability value .05 is considered significant in all of the above statistical tools.

Results

A total of 167 patients were enrolled in the study. In the first trimester, 2 patients were lost to follow up and 6 patients had spontaneous abortion. During the 2nd trimester, 5 patients lost follow up and during the third trimester, 4 patients were lost to follow up. The remaining 150 women completed the study (Table 2).

Table 2. Distribution of Sociodemographic characteristics of pregnant women in the study sample

Variable	Women with MBQ >2	%	Women with MBQ <2	%	P value
Age					
19-20	4	12.1%	5	4.3%	
21-35	16	48.5%	46	40.5%	.114
26-30	10	30.3%	38	32.8%	
30- 40	3	9.1%	28	22.9%	
Socioeconomic class					
Class1	12	10.3%	7	21.2%	
Class 2	36	30.8%	7	21.2%	
Class 3	33	28.2%	8	24.2%	0.825
Class 4	29	24.8%	9	27.3%	
Class 5	7	6.0%	2	6.1%	
Parity					
Primi	17	51.5%	57	48.7%	0.777
Multi	16	48.5%	60	51.3%	
Obesity					
19-24.9	22	66.7%	89	76.1%	0.414
25-29	10	30.3%	27	23.1%	
>30	1	3.0%	1	0.9%	
1st trimester	17	11.3%	133	88.7%	0.008
2nd trimester	12		138		0.144
3rd trimester	31		119		0.060

It is significant from the table that most of the subjects (41.3%) belong to the group between 21 -25 years of age. The mean age of subjects was 26.69 +/ - 5.04 years in our study population. In our study population, subjects belonging to the age group 21-25 years 48.5% had increased sleep disturbances and reduced quality of sleep. There was no statistical significance difference between age and MBQ (P=0.114). There was no statistical significance in the socioeconomic class between the two groups (P.value=0.825). There is no statistical significance from the table between BMI range and MBQ score (P=0.414). There was statistical significance among study participants in the first trimester, indicating poor sleep quality in the first trimester having high statistical significance (Table 3).

Table 3. Distribution and ORs of pregnancy outcomes across the study sample (N=150)

Variable	MBQ >2	%	MBQ <2	%	P value	OR
CS	19		35		0.003	3.354
GHTN	9		22		0.665	1.239
GDM	11		16		0.009	3.388
LBW	14		41		0.437	0.978
APGAR <7	5		22		0.630	0.635

In terms of gestational diabetes mellitus, 33.3% of GDM has MBQ score more than 2 and 13.7% had MBQ score less than 2. There is statistically significant association between MBQ and gestational diabetes mellitus (P=00.009) Higher odds ratio 3.38 indicates positive association between poor sleep and GDM. On assessing the association between MBQ score and gestational hypertension, it was found to be statistically not significant (P=0.665).

In our study sample we observed that participants with a score more than 2 (as per MBQ) had statistically significant risk of going in for cesarean delivery compared to those who had MBQ score <2 (P=0.027). Odds ratio was significantly higher indicating positive association between cesarean delivery and poor sleep quality (3.541).

There was, however, no statistical significance between the two groups in terms of birth weight [P value = 0.807]. Among the participants who had MBQ >2, 5(15.2%) had Apgar score <7 and 28(84.8%) had APGAR>7. Similarly, 117 participants had MBQ <2, out of which 22(18.8%) had Apgar score <7 and the remaining 95 (81.2%) had Apgar score >7. There was, however, no statistical significance between the two groups. [P value =0.630].

Discussion

Sleep disturbances are the most common complaint but often ignored. It has a significant impact on the antenatal women, fetus and mode of delivery. Studies conducted in India also show clinical significance of sleep disturbances in pregnancy and their association with outcomes **(9)**. OSA has been linked to preterm birth, low APGAR score <7, low birth weight (LBW), small for gestational age (SGA), caesarean section (CS) and preeclampsia **(10)**. Hence, preventive measures and early intervention can reduce the complications arising during pregnancy thereby reducing healthcare cost. Very few studies published in Asia show that the prevalence of OSA and snoring in pregnant women is high **(10)**. The OSA prevalence in Asian antenatal women is 0.3% -5%. In terms of parity in the study population; Multiparous (50.7%) and primi (49.7%) antenatal women did not have statistical association with MBQ score [P=0.777]. Similarly, findings were observed by) O'Brien, Bullough **(9)** in which antenatal women were enrolled in the study and compared with non-snorers' pregnant women.

There is also mounting evidence to show that certain intrapersonal factors, such as women's obesity status, make a significant contribution to and/or aggravate sleep disorders in antenatal women. Study by Pien and Schwab **(1)**, after statistical analysis maternal age and first trimester BMI was significantly associated with OSA. According to preliminary findings enhanced erythropoiesis can lead to high levels of nucleated red blood cells in the umbilical cord which are linked with the onset of snoring during pregnancy. During hypoxia erythropoiesis occurs and is associated with conditions such as fetal growth restriction and maternal hypertension. Though in our study we did not find association between OSA and GHTN using MBQ. Using the MBQ questionnaire in our study population, results showed statistical significance (P=0.003) between cesarean and participants with higher MBQ score >2. Similarly, a study by Naghi et al., assessed 88 antenatal women using MBQ score > 2 in the late pregnancy and found poor quality of sleep were 20% more likely to have prolonged labor and undergo caesarean section. (P=0.016) **(11)**. One of the principal processes through which reduced sleep results in elevated glucose levels is glucose intolerance, which is defined as failure to maintain euglycemia by metabolizing exogenous glucose via insulin-dependent and non-insulin dependent mechanisms **(12)**. Using the MBQ score there was a high statistical significance between sleep quality and GDM (P=.005). Miguel Angel et al. **(13)** did a meta-analysis and observed that SDB increased GDM risk with OR of 3.06.

Previous literature had mixed outcomes when comparing poor sleep quality and low birth weight. In our study, 42.4% of study participants had low birth weight babies and MBQ >2. Lastly, MBQ did not show statistical significance between poor sleep and low birth weight. Similarly, another study by Bourjeily, Ankner **(14)** stated that when fetal birth weight for gestational age was considered, there was a pattern towards a link between snoring and fetal growth restriction (OR 1.9, 95% CI 0.8 –4.3). The P. value was not significant to show difference. At the end of pregnancy, foetal outcomes were assessed by the APGAR score at 1 min and 5 min intervals. In our study population, 15.2% of participants had low

Apgar<7 and MBQ >2.18.8% of the study population had MBQ <2. Hence, there was no statistically significant difference between Apgar score and sleep quality. Another study conducted in India by SK Sharma, Nehra **(3)** observed that frequent poor sleepers who scored MBQ more than 2 multiple times during their visits had an odds ratio of 4,9 (95% CI 1.2- 20.2, P=0.028) of having a low Apgar score. But there was a statistically significant association between MBQ and low Apgar score **(15)**.

Few limitations in this study were large sample size and prolonged observation period were necessary to prove the relationship between poor sleep quality d adverse pregnancy outcomes. Polysomnography studies are needed for exact diagnosis. Sleep quality in the preconception period was made retrospectively, thus amounting to recall bias. Weight gain during pregnancy was not elicited in the study though the BMI was calculated from the pre-pregnancy weight. As smoking among women is a social stigma in our community and not very prevalent, smoking history was not elicited.

Conclusion

With increasing urban lifestyle and stress among young pregnant women, poor sleep quality and reduced duration of sleep has become very common but often ignored. Despite various literatures showing an association between poor quality and adverse pregnancy outcomes, data to prove is still lacking. In our study, the high OSA group has a significant association between GDM and caesarean delivery. MBQ scale can be a useful screening tool to assess sleep quality on an OPD basis and its relationship with adverse pregnancy outcomes.

Intervention to prevent risk factors plays the most important role to avoid complications. Preventive measures such as good sleep habits and maternal position mostly left lateral position can be incorporated into the daily routine. The role of CPAP is gaining importance in the management of OSA during pregnancy. Counselling is necessary for all antenatal patients attending the OPD regarding the awareness of various symptoms like leg cramps, snoring, insomnia and should seek medical advice to treat the same and prevent risk factors as a primary level of intervention.

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Statement of Ethics

The patient had signed the informed consent to report the present article.

Conflict of Interest

The authors declared no conflict of interest.

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