

# Sleep disorders in pregnancy: A prospective observational study

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## Abstract

This study aimed to find out different patterns of sleep disturbances in pregnancy and their effect on mother and fetus. A questionnaire-based prospective observational study was conducted at the Department of Gynaecology and Obstetrics, Nil Ratan Sircar Medical College, Kolkata, West Bengal, India. Women with sleep disturbances at start and during pregnancy included in the study were interviewed and examined at recruitment, at 24–32 weeks of gestation, and at term. Of 103 enrolled patients, 99 were followed up till delivery. All the recruited patients developed insomnia. “Changes in sleep-disordered breathing status” was associated with development of hypertension ( $p = 0.003$ ), albuminuria ( $p = 0.037$ ), and gestational diabetes mellitus ( $p = 0.012$ ). It was also associated with 1-min APGAR score of  $<7$  in newborns ( $p = 0.013$ ). Association between sleep parameters and other fetomaternal outcomes, labor, and delivery is statistically insignificant. Insomnia is the most common sleep problem among women having sleep disorders. Little short-term effect on babies’ health (such as low 1-min APGAR score) was found in women having sleep disorders, but no comment can be made on the long-term effects as these were not assessed in this study.

**Keywords:** Sleep, pregnancy, insomnia, sleep-disordered breathing, hypertension.

## Introduction

Sleep has a restorative effect on body and mind for day-to-day functioning. It has also a long-standing impact on health. Sleep is disturbed in pregnancy due to many reasons such as anatomical, mechanical, and hormonal changes that occur physiologically during pregnancy<sup>1</sup>. For most of the expecting mothers, sleep changes during pregnancy begin with hypersomnia, later proceed into insomnia<sup>2</sup>. Most women experience

frequent awakening, sleep disturbances, and restlessness. Associated problems such as snoring, choking awakening, daytime sleepiness also increase<sup>2</sup>.

Women with sleep disorders have increased incidence of pregnancy-induced hypertension, eclampsia, diabetes mellitus, and pulmonary hypertension causing poor maternal outcome<sup>2</sup>. These women experienced longer labors and had higher number of cesarean delivery<sup>3</sup>. Intrauterine growth restriction, fetal heart rate anomaly, and even intrauterine fetal death (IUFD) are poor fetal outcome experienced by these women<sup>1,4,5</sup>. There are limited studies reporting the consequences of sleep deprivation in the pregnant population<sup>1</sup>. This study aimed to find out different patterns of sleep disturbances present during pregnancy and their effect on mother and fetus.

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## Methods

This is a prospective observational study conducted at the Department of Gynaecology and Obstetrics, Nil Ratan Sircar Medical College, Kolkata, West Bengal, India, from April 2011 to March 2012. In this study, 103 women attending antenatal clinic of the OPD were recruited and followed up till delivery.

Antenatal mothers attending antenatal clinic for registration and checkup at or before 20 weeks of gestation meeting the following criteria were included in the study:

1. Complaint of either insomnia or excessive sleepiness
2. History of sleep-related breathing disorders
3. Start of sleep disturbance and present during pregnancy

The following were the exclusion criteria for antenatal mothers:

1. Other medical disorder accounts for the primary symptom
2. Presence of other sleep disorder that could account for the symptoms
3. Known psychiatric illness
4. Addiction to alcohol/smoking/other substances or history of substance abuse
5. History of continuous sleeping pill intake before pregnancy

*Study technique:* Women were asked to elaborate their sleep problems using a questionnaire comprising following questions:

1. Do you have any difficulty to fall asleep when you lie down in bed? (latency to sleep in hours)
2. Do you wake up too early in the morning (earlier than you are supposed to)? (duration of early rising in hours)
3. If you wake up during the night, do you find it difficult to sleep again? (latency to resleep or duration to sleep again after wake after sleep onset, in hours)
4. Has anyone ever told you that you snore?
5. Has anybody ever said that you have difficulty in breathing during the night (like stop breathing or choking awakenings)?

6. Do you suddenly fall asleep during the day or in the middle of some kind of activity?
7. Do you fall asleep anywhere (as on buses, in the classroom, at work, or while driving)?
8. Do you feel sleepy during the day?
9. Have you been taking naps during the day?
10. Do you wake up with the baby movements?
11. Do you wake up because of abdominal pains or contractions?
12. Do you wake up due to dreams or nightmares involving the baby or to childbirth?
13. Do you wake up with heartburn?
14. Average sleep in hours?

Prepregnancy average sleep hours of the patients were also been noted.

Each woman was interviewed at least three times during pregnancy, once during recruitment, then within 24–32 weeks of gestation, and finally, at term. None of the pregnant women had any difficulty in understanding and answering the questions or in recognizing the period of pregnancy. Any nonspecific answer was considered as negative (no). We also considered the events that occurred with a frequency smaller than three times per week as negative (no). Based on previously published study<sup>6</sup>, we took into account the following dependent variables: insomnia, sleep-breathing disorders, excessive daytime sleepiness (EDS), mild sleepiness, and specific awakenings. In this research *insomnia*<sup>6</sup> was defined as a complaint of difficulty initiating sleep, difficulty maintaining sleep, or waking up too early, or sleep that is chronically unrestorative or poor in quality despite adequate opportunity and circumstances, resulting in psychological and physiological changes. *Sleep-disordered breathing* (SDB)<sup>6</sup> was defined as the pregnant woman's awareness of her own snoring or cessation of breathing (choking awakening) while sleeping. We considered *EDS*<sup>6</sup> when they fell asleep suddenly during some activity or in inappropriate places or occasions (i.e., bus, classroom, household work) and *mild sleepiness*<sup>6</sup> when they informed to feel sleepier during the day or that they have been taking naps. We classified as *specific awakenings*<sup>6</sup> those associated to the body movements, dreams or nightmares related to pregnancy, abdominal contractions, and heartburn.

During the first and subsequent antenatal visits, routine antenatal checkups (clinical examinations and investigations) of the women were carried out. Women were admitted per their obstetric requirement. These admitted women were followed up till their discharge from hospital. The recruited women were looked for any adverse development in later stages of pregnancy, such as development of hypertension, albuminuria, and gestational diabetes mellitus (GDM). Their modes of delivery with duration of active labor were also observed. The following parameters of newborn were noted: term or preterm, birth weight, APGAR score at 1 and 5 min, and NICU admission with its duration.

Maternal and perinatal outcomes of the cases of sleep disorders were collected and the data were analyzed and represented in tables. Microsoft Excel and SPSS software, version 17, were used for data analysis and statistical calculations.

## Result

Of the 189 women considered for the study, 148 (78.31%) were found eligible. Forty-one women were ineligible due to unsure/forgotten last menstrual period (38, 92.68%) and an estimated gestational age >20 weeks calculated from early week USG (3, 7.32%). Of the 148 women, 103 were included for the study and 45 were excluded. The mothers were excluded due to medical disorders such as hypothyroidism or hypertension (14 of 45, 31.11%), sleep disorders in prepregnancy state (25 of 45, 55.56%), known psychiatric illness (2 of 45, 4.44%), addiction (1 of 45, 2.22%), and history of continuous sleeping pill intake (3 of 45, 6.67%). Among 103 women included, 4 (3.88%) were lost to follow-up and rest 99 were followed up. Among 99 women, 83 reached to term and 16 (16.16%) had preterm deliveries.

Recruited mothers were mostly in the 20–24 years age group (46.6%, 48 of 103). Of the 103 recruited mothers, 11 (10.7%) were <20 years of age and 15 (14.6%) were of >30 years. Mean age of recruited mothers was  $24.2 \pm 4.2$  years. Nulliparous, primiparous, and multiparous were 55.3% (57 of 103), 36.9% (38 of 103), and 7.8% (8 of 103), respectively.

Table 1 shows the presentation of different sleep problems at the time of recruitment, at 24–32 weeks of gestation, and at term. Different sleep problems show changes with gradual increase in the period of gestation.

At term, all the recruited patients had insomnia. The prevalence of EDS and mild sleepiness almost maintained a plateau throughout pregnancy. The prevalence of SDB and specific awakening increased substantially. In our study population, mean latency to sleep in initiation increased from  $0.82 \pm 0.33$  to  $1.25 \pm 0.49$  hours; mean duration of early awakening increased from  $0.75 \pm 0.27$  to  $1.06 \pm 0.42$  hours; mean duration of sleep during prepregnancy condition was  $7.95 \pm 0.73$  hours; and mean duration of sleep at the time of recruitment was  $6.58 \pm 0.79$  hours, at 24–32 weeks of gestation was  $5.75 \pm 0.74$  hours, and at term was  $5.29 \pm 0.67$  hours. Average sleep time (in hours) was found to decrease from prepregnancy to term.

Eighty-three term and 14 preterm babies were delivered. There were 2 IUFDs (both preterm) and 2 perinatal deaths. Forty-six babies were of low birth weight. Thirty babies had 1-min APGAR score of <7 and eight had 5-min APGAR score of <7. NICU admission was required for 24 babies with a mean duration of  $7.33 \pm 5.08$  days.

Adverse maternal conditions of hypertension, albuminuria, and GDM were noted, respectively, in 38.4% (38 of 99), 26.3% (26 of 99), and 17.2% (17 of 99) of recruited mother.

Normal delivery, instrumental delivery, emergency lower uterine cesarean section (LUCS), and elective LUCS were noted, respectively, in 46.5% (46 of 99), 19.2% (19 of 99), 14.1% (14 of 99), and 20.2% (20 of 99) of recruited mothers. No significant difference was observed in nulliparous and parous women in respect to mode of delivery at term. Mean length of labor was found to be  $5.65 \pm 2.06$  hours.

Table 2 shows development of hypertension, albuminuria, and GDM is statistically significant with change in the SDB status. Preterm labor is not significant with changes in sleep parameters. Results of  $\chi^2$  analysis given in Table 3 show SDB has a statistically significant association with 1-min APGAR scores ( $p = 0.013$ ), but it is insignificant with 5-min APGAR scores ( $p = 0.24$ ), NICU admission ( $p = 0.095$ ), and birth weight ( $p = 0.54$ ). Pearson correlation analysis shows no statistical significant association with sleep duration at term and length of labor ( $r = 0.037$ ;  $p = 0.798$ ). No statistically significant association was observed with different modes of delivery and less than 5 hours sleep at term ( $p = 0.776$ ).

Table 1: Distribution of sleep problems

Sleep problems	At the time of recruitment (n=103)		24-32 weeks (n=99)		At term (n=83)	
	No. of pts.	% of pts	No. of pts.	% of pts	No. of pts.	% of pts
Insomnia	90	87.38	96	96.97	83	100
Sleep- breathing disorders	17	16.51	30	30.3	33	39.76
Excessive day time sleepiness	17	16.51	11	11.11	16	19.28
Mild sleepiness	85	82.52	84	84.85	69	83.13
Patients having specific awakening	21	20.39	47	47.47	50	60.24

Table 2: Association of sleep problems and hypertension, albuminuria, GDM, preterm labor (multivariate logistic regression)

Sleep parameters	Hypertension		Albuminuria		GDM		Preterm labor	
	Odds ratio	P value	Odds ratio	P value	Odds ratio	P value	Odds ratio	P value
Insomnia at recruitment	.497	0.277	0.376	0.130	.620	0.538	0.466	0.317
Changes in SDB status	5.257	.003	3.188	0.037	4.344	0.012	0.855	0.827
Changes in EDS status	.612	0.411	.639	0.497	1.248	0.748	0.248	0.198
Changes in mild sleepiness status	1.980	0.189	2.434	0.103	.755	0.700	0.361	0.215
Changes in specific awakening status	1.099	0.833	1.214	0.691	1.318	0.628	0.799	0.692

GDM, gestational diabetes mellitus; SDB, sleep disordered breathing; EDS, excessive daytime sleepiness.

Table 3: Association of SBD changes with baby outcome (N=99)

SBD changes	1-min APGAR <7				5-min APGAR <7				NICU admission				Birth weight (kg)			
	Yes		No		Yes		No		Yes		No		<2.5		≥2.5	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Yes	11	11.1	10	10.1	3	3.03	18	18.2	8	8.08	13	13.1	11	11.1	10	10.1
No	19	19.2	59	59.6	5	5.05	73	73.7	16	16.2	62	62.6	35	35.6	43	43.4
Total	30	30.3	69	69.7	8	8.08	91	91.9	24	24.2	75	75.8	46	46.5	53	53.5

## Discussion

Two methods are available for testing the sleep problem: one is objective (laboratory testing known as polysomnography) and the other is subjective (testing by questionnaire method). The limitation of objective testing is lack of sleep laboratories in India and other third-world countries. Ours is a subjective study based on a simple, brief, easy-to-understand questionnaire. This questionnaire has been widely used earlier in international journals for obstetric population<sup>6</sup>. Studies

conducted using this or similar questionnaire have been vastly accepted internationally.

In this study, insomnia appeared to be the most common problem among sleep-disturbed obstetric population. At term, all our recruited women had insomnia. One Indian study<sup>7</sup> calculated prevalence of *disorders of sleep initiation and maintenance* in pregnancy to be 47.6%. Insomnia in pregnancy is found to be overwhelmingly common problem. It increases and aggravates with increasing gestational period<sup>8</sup>. Studies

have shown short sleep duration to be associated with preeclampsia<sup>9</sup> and diabetes mellitus<sup>10</sup>. In our study, we failed to find any association with insomnia and pregnancy outcome in multivariate logistic regression analysis. Therefore, insomnia though most common does not have much significant effect on health.

Different studies<sup>6,7</sup> reported SDB in pregnancy ranges from 9.5% to 45%. In this study, the incidence of SDB among sleep-disturbed women was found to increase from 16.5% to 39.8%. Snoring and choking awakening, the two components of SDB, were also found to increase with the period of gestation, similar to the trend observed in other studies. It is difficult to find out exact prevalence of snoring as women in general tend to underreport snoring on questionnaires<sup>11</sup>. Among different sleep parameters, we found only change in SDB status to be statistically significant for development of hypertension, albuminuria, and GDM. Most of the studies have similar findings<sup>10,12,13</sup>. Okun *et al.*<sup>14</sup> postulated a hypothesis that explains such adverse pregnancy outcome in sleep disorders mediated by inflammatory pathways involving cytokines and leukotrienes.

In our study, 58% recruited patients have had nap at the time of recruitment, which reduced subsequently (33%). Researchers<sup>8</sup> reported that most pregnant women have daytime naps, which may add more than 1-h sleep to total 24-h sleep time. Napping could reduce sleep problems such as daytime dysfunction<sup>8</sup>.

This study identifies the patterns of sleep disturbances in pregnancy using a simple, easily comprehensible questionnaire in a limited-resource setup. However, study population was small. Lack of objective measurement diminished the accuracy of the study. Sleep duration and other data depend on memory of the patient, and hence, there is a chance of recall bias. Thus, further well-designed studies are required in this less investigated area.

## Conclusion

Insomnia is the most common sleep problem among pregnant women having sleep disorders. SDB is most significant sleep problem associated with the development of hypertension, albuminuria, and GDM.

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