

**A Cross Sectional Study on Sleep Quality among Pregnant Woman Ina Tertiary Care Centre in Chennai, India****Krithiga Sivakumar<sup>1</sup>, Vishnu Sundar Ramachandran<sup>2</sup>, Seenivasan P<sup>3</sup>, Kartheepan Ganesan<sup>4</sup>**<sup>1,3,4</sup>Department of Community Medicine, Govt Staneley Medical College, Chennai<sup>2</sup>Department of Plastic Surgery, Sri Ramachandra Institute of Higher Education and Research, Chennai

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Conflict of interest: Nil

**Abstract:****Background:** Sleep a normal physiological phenomenon. During pregnancy, women are more likely to experience sleep disorders and poor sleep quality. Sleep disturbances may be associated with increased risk of adverse delivery outcomes. Most studies in the past have focused only on specific sleep disturbances, evaluating a heterogeneous population. Hence this cross-sectional study assessed the quality of sleep among pregnant women and compared differences in sleep quality among trimesters and assessed day time sleepiness**Methods:** This is a hospital based Cross-sectional study conducted among adult pregnant women attending antenatal clinic at a tertiary care centre in Chennai. Adult Pregnant women (gestational age >6 weeks) attending antenatal clinic between June-August 2018 were consecutively included in the study. Antenatal women with history of chronic ailments & medications that may affect sleep, those who could not communicate were excluded. Data was collected by face-to-face interview using a questionnaire after obtaining informed consent with structured questionnaire including Pittsburgh Sleep Quality Index Questionnaire and Epworth Sleepiness Scale questionnaire. SPSS 16.0 was used for analysis. Chi square test was done and P<0.05 was considered significant.**Results:** Out of 264 study participants 77.3 % had low quality sleep with Pittsburgh Sleep Quality Index Questionnaire (Cut off of >5 ) 53.4% had mild daytime dysfunction using Epworth Sleepiness Scale questionnaire. Chi square test found association between sleep quality and trimester & sleep latency among parity status of women. Other factors were not found to be significantly significant.**Conclusion:** Majority had poor quality sleep, there was significant association between trimester and parity status with sleep quality.**Keywords:** Sleep Quality, Pregnancy And Sleep, Pittsburg Sleep Index, Epsworth Sleepiness Scale.

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**Introduction**

Sleep a normal physiological process, is an outcome of the circadian rhythm. It is a reversible state of reduced consciousness, characterized by slowing of brain electrical activity, altered muscle tone, and autonomic changes [1]. Sleep is also a heightened anabolic state, accentuating the growth and repair of the immune, nervous, skeletal and muscular systems [2].

Disturbed quantity or quality of sleep interferes with the normal mental and bodily functioning. Pregnancy is a process that creates significant anatomical, physiological and biochemical changes in a woman's life [3]. During pregnancy, women are more likely to experience sleep disorders including both poor sleep quality and reduced sleep duration [4]. The hormonal changes which affect sleep wake cycle and sleeping structure also cause physical and mental changes that may lead to sleep

disorders [5]. By causing changes in immune system, sleep disorders can be associated with undesirable consequences like anxiety, reduced pain tolerance, premature delivery, low birth weight, disorders in glucose tolerance, blood pressure disorders and depression during and after pregnancy [6].

About 78% of pregnant women reported more sleep disturbances during pregnancy than at any other time in their life [4]. Another study also found that most pregnant women reported sleep disturbances of some severity and 30% reported never getting a good-night sleep during pregnancy [7]. Signal et al noted that total sleep time of pregnant women was less on average than non-pregnant women in the population. In addition, the risk of excessive daytime sleepiness in pregnant women is 1.8 times more than that seen in non-

pregnant women [8]. Many factors that influence sleep quality include rise in progesterone levels [9], nausea, vomiting and frequent urination [10], heartburn and increase in fetal movements [11]. Louis J et al noted that more pain and discomfort during labor, higher rates of preterm delivery, greater likelihood of caesarean deliveries and postpartum depression are associated with impaired maternal sleep [12].

Facco et al noted that mean sleep duration was significantly shorter and the proportion of patients who reported frequent snoring was significantly greater in third trimester. [13]. Assessment of sleep quality is clinically relevant because sleep disturbances may be associated with increased risk of adverse delivery outcomes as well as with postpartum depression. Several studies have focused only on specific sleep disturbances. Also, not many studies have evaluated quality of sleep and changes in sleep pattern in developing countries especially Indian antenatal population.

**Objectives:** Hence this cross-sectional study is aimed at exploring the quality of sleep among pregnant women visiting antenatal clinic, To compare differences in sleep quality among three trimesters of pregnancy and to assess day time sleepiness

#### Methods

**Study Design:** Hospital based Cross-sectional study

**Study Setting:** Ante-natal clinic at a tertiary hospital in Chennai, India.

**Participants:** Pregnant women attending the antenatal clinic.

#### Inclusion criteria:

All adult Pregnant women (gestational age >6 weeks) attending antenatal clinic Stanley medical college, between June - August 2018 who had given informed consent were consecutively included in the study until the calculated sample size was achieved.

#### Exclusion Criteria:

Those with history of chronic ailments or medications that may affect sleep, those who could not communicate due to morbid illness

**Sample size:** calculated using the formula,  $N = Z_{\alpha} P(1-P)/d^2$  prevalence (p) = 78% [4], absolute precision = 5% The calculated sample size for the study was 264.

**Data collection & Study tools:** Data was collected by face to face interview using a pre tested, semi structured questionnaire containing

#### Part 1 – Demographic questionnaire

#### Part 2 – Pittsburgh Sleep Quality Index Questionnaire

The Pittsburgh Sleep Quality Index (PSQI) [14]. The PSQI is a 19-item, self-rated questionnaire designed to assess sleep quality and disturbance over the past month. The 19 items are grouped into 7 components, including (1) sleep duration, (2) sleep disturbance, (3) sleep latency, (4) daytime dysfunction due to sleepiness, (5) sleep efficiency, (6) overall sleep quality, and (7) sleep medication use. Each of the sleep components yields a score ranging from 0 to 3, with 3 indicating the greatest dysfunction.

The sleep component scores are summed to yield a total score ranging from 0 to 21. In distinguishing good and poor sleepers, a global PSQI score > 5 yields a sensitivity of 89.6% and a specificity of 86.5%. [14,20,23]

#### Part 3 - Epworth Sleepiness Scale questionnaire

The Epworth Sleepiness Scale (ESS) [21] is a scale intended to assess daytime sleepiness. The questionnaire asks the subject to rate his or her probability of falling asleep on a scale of increasing probability from 0 to 3 for eight different situations that most people engage in during their daily lives. The scores for the eight questions are added together to obtain a single number from which level of daytime sleepiness can be assessed. Scoring is as follows .0-5 Lower Normal Daytime Sleepiness, 6-10 Higher Normal Daytime Sleepiness, 11-12 Mild Excessive Daytime Sleepiness, 13-15 Moderate Excessive Daytime Sleepiness, 16-24 Severe Excessive Daytime Sleepiness

All the above questionnaires have been validated in India. The questionnaire was translated in local language by professional translators and back translation was done.

The study was approved by institutional ethics committee and participation in the study was purely voluntary and all participants were explained about the study. Data was collected only after obtaining informed consent. Study was conducted according to guidelines of ICMR 2017 ethics guidelines and declaration of Helsinki, 2013. Confidentiality & privacy of the participants was maintained throughout the study.

**Statistical analysis:** CDC's Epi Info™ and IBM Statistical Package for the Social Sciences SPSS 16.0 were used for statistical analysis. Continuous variables were expressed in mean and standard deviation and categorical variables were expressed in percentage and proportions Chi square test was done to find any association between variables and P<0.05 was considered significant at 95% confidence interval.

Data set was checked for missing value and planned to be replaced with arbitrary value. However, we did not have any missing value

## Results

We approached the antenatal women >6 weeks gestation for our study and those satisfying the inclusion criteria were included in our study. A total of 264 study participants participated in our research study. There were no missing data. The mean age of the study population was found to be 25.03 +4.3 years (mean±SD). Most of them (41.6%) belonged to the age group of 24 to 28 years. The mean age at marriage of these participants was 21.8 +3.38 years (Mean+SD). Majority of participants had obtained high school qualification and belonged to nuclear family (59.5%). The participants predominantly (57.2%) belonged to lower middle class according to modified kuppusamy classification. About half the study participants 134 (50.8%) were in their 3<sup>rd</sup> trimester and 128(48.5%) were primigravida.(TABLE- 1)

The sleep quality was assessed using PQSI. The mean global PQSI scores obtained in our study was 7.58 +2.6 (mean±SD). Cut off of >5 was used to classify quality into good and low quality. Majority of study participants i.e, 77.3% (204) had low quality sleep (TABLE – 2). Various sleep components were analyzed using the guidelines and individual scores were obtained based on their self-reporting of the various characteristics of their sleep [14,20,23] and results were as follows.

A total of 122 study participants (46.2%) had self-reported fairly good sleep quality, 90 study participants (34.8%) a fairly bad sleep quality, 29 study participants (11%) very good sleep quality and remaining 23 study participants (8%) reported a very bad sleep quality. Sleep latency was analysed, it was found among 91 study participants (34.5%) had moderate sleep latency (sleep latency score of 3-4), 75 study participants (28.4%) had higher sleep latency (sleep latency score of 5-6), 64 study participants (24.2%) reported mild sleep latency (sleep latency score of 1-2) and 34 study participants (12.9%) were found with no sleep latency (sleep latency score of 0 ).

Most of the participants reported a 197 (74.6%) good sleep duration greater than 7 hours and 35 (13.3%) had sleep duration of 6-7 hours respectively, 23 study participants (8.7%) had sleep duration of 5-6 hours and the rest 9 study participants (3.4%) had asleep duration less than 5 hours. Likewise majority 99 (75.4%) were found to have a sleep efficiency of greater than 85%, 45 study participants (17%) having a sleep efficiency of 75-85%, 12 study participants (4.5%) having a

sleep efficiency of 65-75% and 8 study participants (3%) having a sleep efficiency of less than 65%. We also found 237 (89.9%) of the participants were found to have mild sleep disturbance, 20 study participants (7.6%) were found to have moderate sleep disturbance and 7 study participants (2.7%) were found to have no sleep disturbance. 141 study participants (53.4%) were found to have mild daytime dysfunction(score 1-2), 88 (33.3%) had moderate daytime dysfunction(score 3-4), and 35 (13.3%) had severe daytime dysfunction(score >4 ). Only 1 subject in our study population had used sleep medication (TABLE – 3)

The mean score for day time sleepiness using EPS questionnaire was 6.9 +4.07 (mean±SD). (TABLE – 4). 117 study participants (44.5%) were found to have low normal daytime sleepiness (score 0-5), 109 study participants (41.4%) were found to have high normal daytime sleepiness(score 6-10), 31 study participants (11.8%) were found to have mild excessive daytime sleepiness(score 11-12) and 6 study participants (2.3%) were found to have moderate excessive daytime sleepiness(13-15).None had severe excessive daytime sleepiness.

We analysed PSQI and ESS scores with trimesters of pregnancy applying chi square test (TABLE – 5).It was found that the quality of sleep deteriorates with the progress of trimester of pregnancy as evidenced by a higher bad sleep quality in third trimester i.e. 50% (67 study participants) when compared to the first trimester i.e. 25% ( 9 study participants).

This finding was found to be statistically significant (p value = 0.19). Sleep latency increased with progression of trimesters of pregnancy. Sleep duration decreased with progression of trimesters of pregnancy. Sleep efficiency was highest in second trimester and sleep disturbance was found to be highest among third trimester. Daytime dysfunction and abnormal daytime sleepiness was found to be higher among study participants in second trimester. However, none of these findings proved to be statistically significant.

PQSI and ESS were analyzed with the parity status (TABLE – 6) using chi square test. Higher sleep latency was found among primi women i.e. 70.3% (90 study participants) when compared to study participants with previous pregnancies i.e. 55.9% (76 study participants) which was statistically significant (p value=0.015). Other parameters such a sleep quality, sleep duration, sleep efficiency, sleep disturbance, daytime dysfunction and daytime sleepiness were not found to be significantly different among the two groups. Univariate analysis of other variables with sleep parameters was not statistically significant.

**Table 1: Demographic Distribution of Study Participants**

Variables		Number	Percentage
Age	17-23 years	102	38.6
	24-28years	110	41.7
	29-40years	52	19.7
	Total	264	100
Education status	Illiterate	7	2.6
	Primary school	6	2.6
	Middle school	64	24
	High school	96	36.3
	Post high school diploma	12	4.5
	Graduates	79	30
	Total	264	100
Type of family	Nuclear family	157	59.5
	Joint family	41	15.5
	Three generation family	66	25
	Total	264	100
Socioeconomic status (modified Kuppusamys scale)	Lower class	8	3
	Upper lower class	40	15.2
	Lower middle class	151	57.2
	Upper middle class	64	24.2
	Upper class	1	0.4
	Total	264	100
Trimester of pregnancy	First trimester	36	13.6
	Second trimester	94	35.6
	Third trimester	134	50.8
	Total	264	100
No. of previous pregnancies	primi	128	48.5
	One	90	34
	Two	34	12.9
	Three	9	3.4
	Four	2	0.8
	Five	1	0.4
	Total	264	100

**Table 2: Distribution of Overall Sleep Quality among Study Participants**

Overall Classification of sleep quality		
	Frequency	Percent
Good quality	60	22.7
Low quality	204	77.3
Total	264	100.0

**Table 3: Distribution of Sleep Quality Characteristics by Pittsburgh Sleep Quality Index**

Sleep Quality		n	%
Subjective sleep quality	Very good	29	11
	Fairly good	122	46.2
	Fairly bad	90	34.8
	Very bad	23	8
	Total	264	100
Sleep latency score	0	34	12.9
	1 to 2	64	24.2
	3 to 4	91	34.5
	5 to 6	75	28.4
	Total	264	100
Sleep duration	Greater than 7 hrs	197	74.6
	6 to 7 hrs	35	13.3
	5 to 6 hrs	23	8.7
	Less than 5 hrs	9	3.4

	Total	264	100
Sleep efficiency	> 85%	199	75.4
	75% to 85%	45	17
	65% to 75%	12	4.5
	< 65%	8	3.8
	Total	264	100.7
Sleep disturbance	None	7	2.5
	Mild	237	7.5
	Moderate	20	90
	Total	264	100
Daytime dysfunction score	1-2	141	53.4
	3-4	88	33.3
	>4	35	13.3
	Total	264	100
sleep medication	Yes	1	1
	no	263	99
	Total	264	100

**Table 4: Distribution of Day Time Sleepiness Using Epworth Sleepiness Scale**

Daytime sleepiness	Frequency	Percentage
Low normal	117	44.5
High normal	109	41.4
Mild	31	11.8
Moderate	4	2.3

**Table 5: Association between Sleep Quality and Trimesters of Pregnancy**

Sleep characteristics	Trimester of pregnancy						p value
	First trimester		Second trimester		Third trimester		
	N	%	N	%	N	%	
<b>Sleep quality</b>							
Fairly good/very good	27	75	57	60.6	67	50	0.019
Fairly bad/ very bad	9	25	37	39.4	67	50	
ODDs ratio							
<b>Sleep latency</b>							
No/mild	16	44.4	38	40.4	44	32.8	0.313
Moderate/high	20	55.6	56	59.6	90	67.2	
<b>Night sleep duration</b>							
Greater than 6 hrs	33	91.7	84	89.4	115	85.8	0.546
Less than 6 hrs	3	8.3	10	10.6	19	4.2	
<b>Sleep efficiency</b>							
Greater than 75%	32	88.9	90	95.9	122	91	0.288
Less than 75%	4	11.1	4	4.1	12	9	
<b>Sleep disturbance</b>							
No/mild	34	94.4	86	91.5	124	92.5	0.848
Moderate/severe	2	5.6	8	8.5	10	7.5	
<b>Daytime dysfunction</b>							
No/mild dysfunction	21	58.3	45	47.9	75	56	0.394
Moderate/severe dysfunction	15	41.7	49	52.1	59	44	
<b>Daytime sleepiness using eps scale</b>							
Low normal	16	44.4	32	34.4	69	51.5	0.224
High normal	15	41.7	46	49.5	48	35.8	
Mild sleepiness	5	13.9	13	14	13	9.7	
Moderate sleepiness	0	0	2	2.2	4	3	

**Table 6: Association between Sleep Quality and Parity**

Sleep characteristics	Primi		Multipara		p value
	N	Percentage	N	Percentage	
<b>Sleep quality</b>					
Fairly good/very good	75	58.6	76	55.9	0.656

Fairly bad/ very bad	53	41.4	60	44.1	
<b>Sleep latency</b>					
No/mild	38	29.7	60	44.1	<b>0.015</b>
Moderate/high	90	70.3	76	55.9	
<b>Night sleep duration</b>					
Greater than 6 hrs	116	90.8	116	85.3	0.185
Less than 6 hrs	12	9.4	20	14.7	
<b>Sleep efficiency</b>					
Greater than 75%	117	91.4	127	93.4	0.544
Less than 75%	11	8.6	9	6.6	
<b>Sleep disturbance</b>					
No/mild	115	89.8	129	94.9	0.124
Moderate/severe	13	10.2	7	5.1	
<b>Daytime dysfunction</b>					
No/mild dysfunction	61	47.7	80	58.8	0.069
Moderate/severe dysfunction	67	52.3	56	41.2	
<b>Daytime sleepiness</b>					
low normal / high normal	115	90	111	81	0.057
Mild/ moderate abnormal	13	10	25	19	

### Discussion

This study is taken up as an initiative to find out the actual prevalence of sleep disturbance among the south Indian maternal population. Various parameters of sleep were assessed using Pittsburgh Sleep Quality Index questionnaire and the accompanying daytime sleepiness using Epworth Sleepiness scale for a sample population of 264 antenatal women. Most of the participants were less than 28 years. A majority of population belongs to middle class social hierarchy and a fair number of graduates were part of the study.

After analyzing the data obtained from the study, it is found that majority of the antenatal women suffer from a substantial sleep disturbance. This is in line with many studies [4] that have driven the point that sleep disturbances are prevalent among antenatal women. Pien et al observed a increase in sleep-disordered breathing symptoms during pregnancy [15] while Facco et al [13] also observed that sleep disturbances are common and is increased in a cohort of young and healthy nulliparous women followed prospectively during pregnancy. Similarity, Ko et al found that pregnant women had deteriorating sleep quality compared to normal female counterparts [16]. In contrast, a study done in Ethiopia found prevalence of sleep disturbance to be only 30.8 % [18]. This reason for this difference might be due to the sampling criteria, difference technique or the difference in socio-cultural setting of the women studied. On further analysis, of the demographic factors and maternal characteristics of the study population, we found that except for the trimester and parity of pregnancy, all other factors like age, educational status, socio economic status, occupation, income, type of family etc were not associated with quality of sleep. While, in other study[18], higher maternal age was associated with poor sleep. Also study by

Shazia Jehan[19], has discussed various factors like age, socio economic status , race , marital status and incomes affecting quality of sleep. The possible reason for our finding may be due the study design, sampling method and difference demographic characteristics in the study populations. It was observed from our study that sleep quality was found to be deteriorating as the pregnancy progresses. Correspondingly, few studies also showed that in comparison to first trimester there was a significant fall in sleep quality in the third trimester [13,17]. This may be due to the increased sleep needs in pregnancy contributed by the hormonal changes of increasing progesterone which increase the day time sleepiness and decreases quality of sleep considerably.

During the third trimester, owing to the growing fetus and also with accompanying pain, breathlessness, difficulty in lying down, frequent urination etc sleep might be disturbed. Our study also found nulliparous women to have greater sleep latency than multiparous women The study by Signal et al[8] also supported our finding .In contrast, the study in Ethiopia[18] discusses multiparity to be associated with sleep disturbance. This can be attributed to the fact that nulliparous women have more fear and anxiety about the pregnancy and child birth than multiparous women who had undergone all the physiological changes associated with pregnancy earlier, leading to the sleep latency. In our study, only 12% had abnormal daytime sleepiness similar to study by Taskiran et al[22] . We did not find association with day time sleepiness with any of the other variables.

The main strength of the study was it was able to achieve its objectives in short duration with adequate sample size and validated questionnaires in resource deficient setting. This is one of few

studies about sleep in antenatal population developing country like India

### Limitations of the study

This is a hospital based cross sectional study, included participants from antenatal clinic using convenient sampling. Hence many factors associated with sleep could not be ascertained due to time and resource constraints. There might have been chances of bias. Community based prospective study with better sampling method would have yielded better generalizability. Also, though validated scales are used in this study, it assesses only subjective sleep quality in recent past and not specific for pregnancy.

### Conclusion

We conclude that the magnitude of sleep disturbance in quite high pregnant women and notable sleep disturbance was associated parity and trimester of pregnancy. This requires immediate attention and adequate treatment modalities which will improve patient care.

Further research on various epidemiological factors & predictors associated with sleep should be done to know factors influencing the quality of life and also to prevent adverse outcomes. Hence it is recommended for the pregnant women to be conscious about their sleep. Healthcare provider should educate them about sleep hygiene to improve mental and physical health of the women

### What is already known on this topic

- Sleep disturbances are prevalent in pregnant women and is dependent on various factors.
- Sleep disturbances are often be associated with increased risk of adverse delivery outcomes.
- Although the adverse effects of inadequate sleep on the outcome of pregnancy has been studied in the past, emphasis is not given to effective management of sleep disorders among pregnant women, especially in lower and middle income groups

### What this study adds

- With the results obtained, the magnitude of sleep disturbance in pregnant women is high enough to be considered as important issue.
- Screening of sleep pattern & quality must be done especially for primigravida and those in third trimester
- Emphasis should be laid on understanding sleep health of pregnant women and new initiatives should be taken up to improve the quality of sleep and general health of pregnant.

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