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Status Of Sleep Deprivation Among Pregnant Women In Tertiary Care Hospital: A Cross-Sectional Survey

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Abstract

Introduction: *Sleep disturbances during pregnancy are a common concern, potentially harming both mother and baby, as disrupted sleep patterns can affect their health and well-being, leading to adverse obstetric outcomes by stimulating inflammatory pathways, including increased IL-6 production.*

Aim: *To evaluate the prevalence and age-related differences in sleep deprivation among pregnant women in their second or third trimester.*

Materials and methods: *A cross-sectional survey was conducted among 320 pregnant women aged 18-32 years in their second or third trimester, recruited from the obstetrics and gynaecology (OG) inpatient department of MGMCRI using convenience sampling. Participants were categorized into two age groups (18-25 and 26-32 years). The study included low-risk primigravida women who could read and write in Tamil or English, while excluding those with a history of infertility or multigravida status. After obtaining ethical approval and informed consent, sleepiness was evaluated using the Epworth Sleepiness Scale (ESS), which demonstrated high internal consistency (Cronbach's alpha = 0.88). The ESS scores (0-24) classified sleepiness levels from normal to severe, with scores above 10 indicating excessive daytime sleepiness. The findings showed a significant prevalence of sleep deprivation among the participants.*

Results: *The study examined sleep deprivation in pregnant women using the Epworth Sleepiness Scale (ESS). Group 1 (G1; n=162, mean age 23.71 ± 1.45) and Group 2 (G2; n=158, mean age 27.98 ± 1.64) showed varying ESS scores across trimesters. Severe sleepiness was reported in 22% of G1 and 20% of G2, while moderate sleepiness was common in both groups. G2 had a higher proportion of normal sleepers (27%) than G1 (23%). Across trimesters, G1 showed more moderate sleepiness in the third trimester (48%) than in the second (41%), while severe sleepiness decreased. G2 had more severe cases in the third trimester (27%) compared to the second (20%). These results highlight age and trimester-related variations in sleep patterns during pregnancy.*

Conclusion: *The survey revealed a high prevalence of Maternal sleep deprivation and it can impact both maternal and fetal health. Yoga may serve as a non-pharmacological intervention to improve sleep quality by reducing stress, anxiety, and physical discomfort. Further research using randomized controlled trials is recommended to assess the effectiveness of yoga in improving sleep across pregnancy.*

Keywords: *Sleep deprivation, Pregnancy, Epworth Sleepiness Scale (ESS), Maternal health, Fetal health, Obstetric outcomes, Inflammatory pathways*

INTRODUCTION

Sleep disturbances during pregnancy persist as a pressing concern, with pregnant women frequently reporting sleep problems. Research has explicated the potential deleterious effects of sleep disturbances on fetal development, with maternal stress generating an inflammatory environment.

Prenatal stress, including maternal sleep deprivation-induced inflammatory reactions, remains poorly understood.[1] Studies indicate that pregnant women are more susceptible to severe sleep deprivation compared to nonpregnant counterparts.[2]

Sleep is a physiological state characterized by diminished responsiveness to external stimuli and accompanied by intricate and foreseeable physiological alterations. Beyond being merely a state, sleep

fundamentally alters numerous physiological systems, including various organs.[3] The brain exerts control over all bodily functions at any given moment, encompassing processes such as sleep, the circadian rhythm, and homeostatic cycles.[4,5]

Sleep Deprivation and pregnancy

Disrupted sleep patterns during pregnancy can adversely affect the health and well-being of both the mother and the infant. While 67% of women in the general population report experiencing sleep problems at least a few nights weekly, this figure rises to 84% among pregnant women.[6] Furthermore, pregnant women's total sleep duration is, on average, 35.8 minutes shorter than that of their nonpregnant counterparts.[7]

Insufficient or inadequate sleep results in sleep deprivation, which can impair daily functioning.[8] Sleep deprivation is a condition characterised by inadequate or insufficient sleep sustained over a period of time, characterized as either acute, lasting for a few days, or chronic, persisting for months.[9] If left unaddressed, chronic sleep deprivation can lead to severe consequences for neural and autonomic control, alongside increased oxidative stress, insomnia, and postpartum depression.[10] The observed link between sleep deprivation and adverse obstetric outcomes may be attribute.[11]

- During the first trimester of pregnancy, women often experience increased sleepiness and their sleep onset may be delayed by 30 to 40 minutes. There is also a noted decline in sleep efficiency and a decrease in slow-wave sleep percentage.[12]
- In the second trimester, common complaints include insomnia and disturbed sleep, along with a reduction in overall sleep duration.
- The third trimester is marked by persistent non-restorative sleep and a decrease in both REM and slow-wave sleep percentages.

Chronic sleep deprivation, as a result, negatively impacts the maternal immune system, which may explain the increased risk of maternal and fetal health issues such as gestational diabetes mellitus, eclampsia, and a higher chance of requiring a caesarean section.[13]

Several studies have provided evidence on the mechanisms of action by which reduced sleep may adversely affect maternal and infant outcomes [14] and studies have examined the incidence of sleep deprivation in pregnant women; despite the substantial negative effects it has on mother health. This study aims to investigate the variations in sleep deprivation among different age groups of healthy women in 2nd and 3rd pregnancy trimesters, as determined by the Epworth Sleepiness Scale (ESS).

MATERIALS AND METHODS

This study was undertaken as an interdisciplinary collaborative work between the School of Yoga therapy, Institute of Salutogenesis and Complimentary medicine (ISCM), and the Department of Obstetrics and Gynaecology (OG) of Mahatma Gandhi Medical College and Research Institute, Puducherry. Approval was obtained from the Institutional Human Ethics Committee of MGMC & RI SBV University Project No: MGMCRI/2024/RAC/02/IHEC/02. The study has also been registered on the Clinical Trial Registry-India (CTRI: CTRI/2024/03/064752).

The subjects for the study were referred from the OG inpatient department of MGMCRI. 320 pregnant women aged 18-32 years who are in 2nd and 3rd trimesters of pregnancy assigned into two groups Group 1 & 2 as per the age criteria. The survey was conducted among who satisfied the inclusion criteria were recruited for the study pregnant women who are in low-risk primigravida, in their 2nd and 3rd trimester and can read and write Tamil or English were included in the study. Those who have known history of infertility and multigravida pregnant women were excluded. Convenience sampling method was followed, as the subjects belonged to a vulnerable population, the study was clearly explained and informed consent was received from all the recruited subjects. Participants were grouped into two age categories (18-25 years and 26-32 years) based on developmental stages and career-life stage differences, allowing for examination of age-related differences in sleep deprivation and other variables.

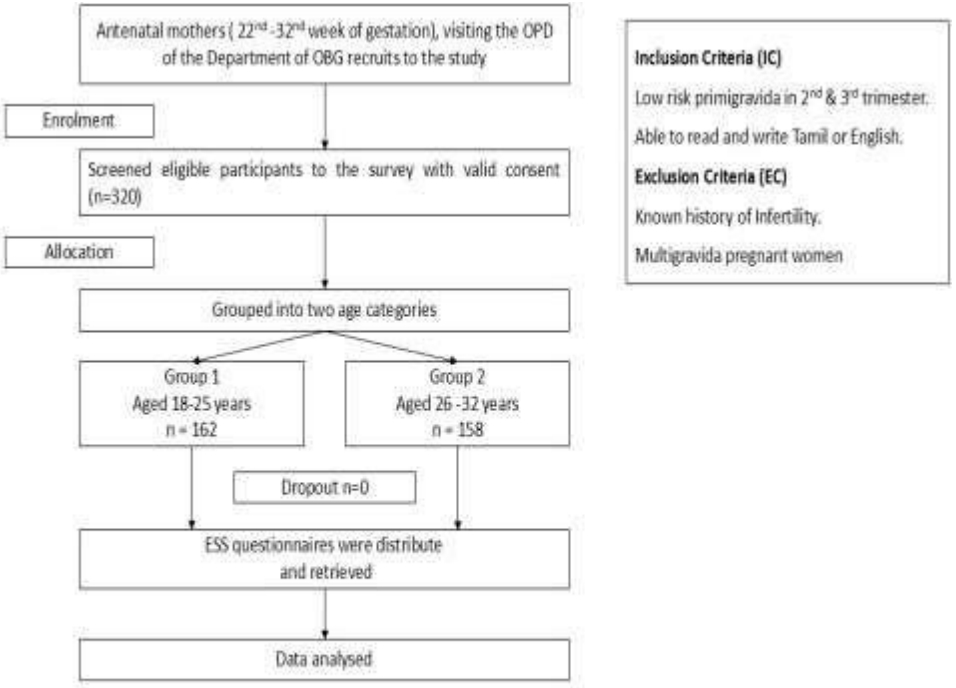

Figure 1. Consort Flow Chart
ESS : Epworth Sleepiness Scale

The study participants were given a self-administered questionnaire. An eight-item self-administered Epworth Sleepiness Scale (ESS) is used, to measure the sleepiness of pregnant women during day time and how they are affected by sleep deprivation.

- This questionnaire comprises 8 questions, each rated on a 0-3 scale (0 = no sleepiness, 3 = high sleepiness), yielding a total score range of 0-24.
- Results are interpreted through numerical ranges: 0-7 (normal=NS), 8-9 (mild sleepiness=MS), 10-15 (moderate sleepiness= MoS), and 16-24 (severe sleepiness=SS).
- The questionnaire demonstrated high internal consistency, as measured by Cronbach's alpha. ESS scores above 10 indicate excessive daytime sleepiness, potentially stemming from sleep deprivation.[15,16]

RESULTS

The study evaluated the variations in sleep deprivation among pregnant women. The survey results were evident in this cross-sectional survey (Table 1)

Table 2 & 3 present the study results. The mean ages for the group 1 (G1) and group 2 (G2) were 23.71 ± 1.45 and 27.98 ± 1.64 years, respectively. The G1 group (n=162) consisted of 106 participants in their second trimester and 56 in their third. The G2 group (n=158) had 114 participants in their second and third trimester. The mean Epworth Sleepiness Scale scores varied across age groups and trimesters. Of 162 pregnant women in G1, 22% showed severe sleepiness, while 20% of 158 pregnant women in G2 did, suggesting higher susceptibility to sleep deprivation in the G2 group.[10] Both groups showed significant moderate sleepiness, with G1 slightly higher. NS was 27% (n=43) in G2 versus 23% (n=37)in G1, and MS was 13% (n=21) in G1 and 10% (n=15) in G2.

Table 1: Categorisation of No. of Participants in the survey

Details	Participants	
ESS	Group 1 (18- 25years)	Group 2 (26 - 32 years)
Normal score (0-7)	37	43
Mild score (8-9)	21	15
Moderate score (10-15)	71	65
Severe score (16-24)	33	35

*ESS- Epworth Sleepiness Scale questionnaire

Table 2: Comparison of the ESS Score among 2nd & 3rd trimester women in Group 1.

Details	Participants	
ESS	2nd Trimester	3rd Trimester
Normal score (0-7)	24	13
Mild score (8-9)	12	9
Moderate score (10-15)	44	27
Severe score (16-24)	26	7

Table 3: Comparison of the ESS Score among 2nd & 3rd trimester women in Group 2.

Details	Participants	
ESS	2nd Trimester	3rd Trimester
Normal score (0-7)	31	12
Mild score (8-9)	10	5
Moderate score (10-15)	50	15
Severe score (16-24)	23	12

ESS results for G1 (n=162, 2nd trimester n=106;3rd trimester n=56) in table 1 revealed varied sleep deprivation across trimesters. In the second trimester, 41% (n=44) had MoS, 23% (n=24) NS, 25% (n=26) SS, and 11% (n=12) MS. The third trimester showed 48% (n=27) MoS, 23%(n=13) NS, 16% (n=9) MS, and 13% (n=7) SS. ESS results for G2 (n=158, 2nd trimester n=114;3rd trimester n=54) in table 2 highlighted varying sleep deprivation in second trimester, 44% (n=50) had MoS, 27% (n=31) NS, 20% (n=23) SS, and 9% (n=10) MS. The third trimester reported 34% (n=15) MoS, 27% (n=12) NS, 27% (n=12) SS, and 12% (n=5) MS.

DISCUSSION

This study investigated the prevalence and patterns of sleepiness during the second and third trimesters of pregnancy. While previous literature reviews highlights sleep deprivation as a common concern for

pregnant women, it often receives insufficient attention in prenatal care. Inadequate sleep has been linked to various complications, including gestational diabetes.

In G1 significant changes were observed between the second and third trimesters. MoS increased from 41% to 48%, indicating deteriorating sleep quality. Conversely, SS decreased from 25% to 13%, possibly reflecting adaptive coping mechanisms. MS rose from 11% to 16%, potentially due to increased awareness of sleep health. NS remained constant at 23%, suggesting a consistent proportion maintaining healthy sleep habits.[17]

The high prevalence of sleep disturbances during pregnancy stems from a complex interplay of factors. As pregnancy advances, disturbed sleep is caused by the gravid uterus, uncomfortable sleeping positions, and increased urination. Hormonal changes, physical discomforts like restless leg syndrome and gastroesophageal reflux, and anxiety/stress related to pregnancy and childbirth further impact sleep quality.[17] These factors collectively contribute to sleep disturbances, highlighting the need for healthcare providers to address these issues and support expectant mothers.[19]

Poor sleep quality in pregnant women significantly impacts maternal and fetal health, necessitating targeted interventions and education on sleep hygiene. In G2, sleep patterns shifted notably from the second to third trimester. While 27% have NS, 20% and 27% suffers from SS in G1 &G2 respectively and 9% and 12% have MoS in G1 &G2 respectively. This indicates a progression towards increased sleep deprivation, potentially due to physical discomfort, heightened fetal movement and childbirth anxiety in the third trimester. [20]

Throughout pregnancy, sleep often adopts an insomnia-like profile, characterized by reduced REM sleep and increased wakefulness, leading to sleep deprivation and poorer outcomes. The rise in sleep deprivation during the third trimester suggests that interventions could be particularly beneficial then.[21] Poor sleep quality and altered sleep duration are linked to adverse fetal outcomes like compromised growth, preterm birth, and stillbirth. Further research should explore factors contributing to these sleep pattern changes and investigate interventions to improve sleep quality, especially in the third trimester.[22]

A comparative analysis of pregnant women in G1 and G2 revealed distinct sleep pattern changes across the second and third trimesters. Normal sleep remained consistent for both groups (23% G1, 27% G2), suggesting a resilient subset. Moderate sleep increased with advancing pregnancy in both groups, from 11% to 16% in G1 and 9% to 12% in G2.it has been observed that G1 have NS compared to G2 while they report more MoS in the second trimester. Severe sleep decreased in G1 (25% to 13%) but significantly increased in G2 (20% to 27%). These variations highlight the dynamic nature of sleep changes, with maternal age being a critical influencing factor.[23] In G1, sleep quality appeared to improve as pregnancy progressed (less SS), whereas G2 showed worsening sleep challenges (high SS) nearing term, possibly due to increased discomfort, complications, or hormonal changes.[24]

Several studies have concluded that prenatal yoga increases mean sleep quality scores and decreases cortisol levels through pranayama and various yoga practices, which activate autonomic nerve responses and modulate hormone levels. [25,26] Prenatal yoga has been shown to be an effective non-pharmacological approach in alleviating discomfort during pregnancy, particularly in improving sleep quality and reducing anxiety. This results in improved sleep quality and reduced sleep disorders in pregnant women. Yoga is the best means towards a preparation for pregnancy and child birth. [27] Further research is essential to elucidate the underlying causes of these age-related differences, considering factors like lifestyle and physiological variations, and to assess the long-term impacts on maternal and fetal health for improved prenatal care.

CONCLUSION

In conclusion, the evidence strongly suggests that maternal sleep patterns and deprivation during pregnancy have far-reaching consequences for both maternal and fetal health. These findings underscore the importance of addressing sleep issues during pregnancy to optimize outcomes for both mother and child. Future research should focus on longitudinal studies to better understand the long-term effects and potential interventions to mitigate these risks and a personalized approach to manage sleep issues during pregnancy, taking into account both maternal age and gestational stage and fetal health.

Yoga is a traditional system used as an adjuvant therapeutic modality in many disorders. It has also been evidentially proven to support the theory and has been supported by many scientific publications. Hence we understand that yoga may be implemented to enhance sleep quality in pregnant individuals, particularly during the second and third trimesters, by alleviating physical discomfort, mitigating stress and anxiety, and promoting relaxation. Given the documented high prevalence of sleep deprivation among pregnant women, as observed in our survey study, a need of research investigation focusing on yoga as an intervention is necessary. Suggesting methodological approaches, such as randomized controlled trials or longitudinal study designs, are crucial for yielding valuable insights into the benefits of yoga for sleep quality throughout gestation.

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