

Factors associated with poor sleep quality and excessive daytime sleepiness in late pregnancy: A pilot study in an antenatal unit

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Abstract

Objectives: To assess factors associated with poor sleep quality and excessive daytime sleepiness (EDS) in late pregnancy.

Methods: A cross sectional study was carried out on 109 pregnant women in their third trimester admitted to Teaching Hospital Peradeniya using validated Sinhala translations of both Pittsburgh Sleep Quality Index (PSQI) and Epworth Sleepiness Scale (ESS). Consecutive sampling was used from February to April 2021.

Results: Application of PSQI demonstrated that 59.6% had a poor overall sleep quality (PSQI score >5). Subcomponent analysis showed poor sleep duration (< 06 hours per day) in 27.5%, sleep latency of over 30 minutes in 29.4%, poor sleep efficiency among 33.9% and day-time dysfunction in 30.3%.

Poor overall sleep quality was associated with presence of foetal movements (OR=11.8, 95% CI=1.5-93.5) and backache (OR=3.8, 95% CI=1.2-12.3). Poor sleep duration was associated with the presence of one or more pregnancy related complications (OR=3.4, 95% CI=1.4-8.5) and advanced maternal age over 35 years (OR=3.7, 95% CI=1.4-9.7). Increased sleep latency over 30 minutes was seen in mothers over 34 weeks of gestation (OR=9.1, 95% CI=2.9-28.6) and over 10kg of weight gain (OR=5.3, 95% CI=1.2-24.4).

Application of ESS demonstrated 26.6% had EDS, which was associated with maternal employment (OR=2.8, 95% CI=1.1-7.1) and higher educational status (OR=4.7, 95% CI=1.5-15.1). EDS did not result in poor sleep quality, however, mothers experiencing insomnia had a higher PSQI score (Mean \pm SD 7.2 \pm 3.7 vs 6.2 \pm 3.4 hours, p=0.044).

Conclusion: Majority of pregnant women in third trimester had poor overall sleep quality. EDS was seen among one fourth. Modifiable risk factors were associated with poor sleep quality and EDS.

Key words: sleep quality, daytime somnolence, PSQI, epworth scale, pregnancy

Introduction

Sleep is a vital neurobiological function that is necessary for the normal physiological functioning of the human body¹. Poor sleep quality is prevalent in the

general population, and women are more likely to have sleep related problems than men².

Pregnancy is a state of multiple changes in a woman, including physiological, anatomical, psychological and

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social changes. Sleep disturbance, inadequate sleep duration, poor sleep quality and excessive day time somnolence (EDS) are commonly seen during pregnancy and significantly increase with the advancement of pregnancy^{3,4,5}. Presence of sleep abnormalities in the third trimester (T₃) have been found to be vital for normal health and well-being of both mother and foetus^{6,7}.

Age, gestational age, parity⁸, weight gain⁹, trimester⁶, socio-economic status^{6,10,11}, psychological stress and other pregnancy related complications¹² are known to associate with poor sleep quality in pregnant women. Poor sleep duration in pregnancy is found linked to race, insurance status¹³, parity¹⁴ and marital status^{15,16}. EDS is found to be associated with Hypertension in pregnancy (HIP), gestational diabetes mellitus (GDM) and foetal growth restriction (FGR)¹⁷, younger age, trimester, parity, and employment¹⁸.

The Pittsburgh Sleep Quality Index (PSQI) is a widely used standardized, sleep quality assessment tool in clinical and research settings. The PSQI has been found to have a good construct validity and reliability for assessing sleep quality among pregnant women where a score of >5 was considered as poor sleep quality¹⁹. Many previous studies have used PSQI to assess the sleep quality among pregnant women^{10,12}. The Sinhala translation of the PSQI used in this study was also found to have a good construct validity and reliability for the assessment of sleep²⁰. Epworth sleepiness scale (ESS) is a standardized assessment tool to detect EDS that is also translated to Sinhala and validated for the use of pregnant women^{21,22,23}.

It was considered to be important to characterize prevalences of both poor sleep quality and EDS, and their associated factors among pregnant women in South-Asian region, including Sri-Lanka. The socio-demographic and lifestyle factors differ greatly in South-Asian region to that of the rest of the world, hence the importance of this study. Although many studies have highlighted the importance of early education, screening and treatment on sleep related disorders in pregnant women to ensure better health of the foetus and the pregnant women, only a few studies have elaborated on the components of PSQI⁶. Thus, the aim of this study was to assess sleep quality and EDS, and their associations in late pregnancy. We anticipate this would help to improve screening and intervention programs to prevent unfavourable

outcomes in the mother and foetus due to poor sleep in pregnancy.

Materials and methods

A cross sectional study was carried out among 109 pregnant women T₃ of pregnancy, admitted to Teaching Hospital Peradeniya, Sri Lanka. Consecutive sampling was used to recruit from February to April 2021. All pregnant women above the age of 18 years and fluent in Sinhala, who were admitted for confinement or medical reviews were recruited. Women with significant obstetric complications or those admitted for obstetric emergencies warranting emergency care were excluded. Informed written consent was obtained from all the participants of the study.

Data were collected on day one of admission, using an interviewer-assisted, self-administered questionnaire in Sinhalese which was the native language of majority of the women, which included PSQI and ESS for objective symptom assessment. PSQI was used to assess sleep quality in the preceding one month. Some of the questions on second hand information required the participants to obtain the assistance of the bed partner/husband. PSQI has seven components including; subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. The component scores were summed to produce a global score ranging from 0 to 21, where a higher score indicated poor sleep quality. Those with a PSQI score >5 was considered to have poor overall sleep quality²⁴. Subjective sleep quality was based on participant assessment of sleep quality on rating on a scale of 0-3. Sleep efficiency was derived as a percentage of actual hours slept from the hours in bed, while sleep latency was derived by scoring the time to fall asleep and frequency of being unable to fall asleep within 30 minutes during a week.

The ESS is an 8-point, self-administered questionnaire which required the respondents to rate their usual chances of falling asleep during eight common activities, on a scale of 0-3. The 8 item scores were summed and ranged from 0-24. The higher the ESS score, the higher the daytime somnolence²⁵. In this study respondents with a Score of >12 on the ESS was considered to have excessive daytime somnolence.

Additionally the questionnaire consisted of enquiries related to socio-demographics (education level, employment, etc.), pregnancy (parity, pregnancy related complications, weight gain, etc.), past history of sleep disorders and perceived causes for sleep disturbances.

Descriptive statistics were used to describe the population characteristics. Differences were assessed using Chi-squared and Fisher's Exact tests for categorical variables (Eg. Sleep quality, educational qualifications, employment, etc.) and Mann-Whitney-U-test for skewed non-parametric variables (time spent in bed, PSQI score). We considered 5% probability and 95% confidence intervals for statistical significance.

Results

A total of 115 women in T₃ were recruited to the study. There were 5% of incomplete questionnaires, leaving 109 participants for analysis. Of them, 86 (78.9%) were between the age of 18-35 (Mean age 29.8 ± SD 6.1) years. In the study population, 105 (96.3%) were Sinhalese, 81 (74.3%) were housewives and 95 (87.2%) had received both primary and secondary education. The four non-Sinhalese were Muslim ethnics who were fluent in Sinhala and the questionnaire was interviewer assisted and explained in detail to them.

Sixty six (60.6%) women in the study population were multiparous (median parity 2, IQR 1-3) and 90 (82.6%) were in the late third trimester, i.e., beyond 34 weeks of gestation (mean gestational age 36.3 ± SD 3.5 weeks). Approximately 90% of the women were previously healthy before pregnancy, with only 11 (10.1%) having at least one pre-pregnancy comorbidity such as diabetes mellitus, hypertension or ischemic heart disease. However, during pregnancy 30 (27.5%) mothers suffered from at least one pregnancy associated complication, including GDM, PIH, FGR or psychological stress. The median current weight of the study population was 66kg (IQR 59-73kg), while the median weight gain during the entire pregnancy to the time of study was 10kg (IQR 8-15kg). Approximately 34 (31.2%) had a weight gain of more than 10kg from the pre-pregnancy weight to the time of study (Table 1).

The median time of waking up was 6.00 a.m. The median duration that the participants had slept was

seven hours (IQR 5-8 hours). The median Overall PSQI score was 6 (IQR 4-9), while an overall poor sleep quality, defined as PSQI score >5, was observed in 65 mothers (59.6%). Components of the PSQI studied demonstrated that 30 (27.5%) had poor sleep duration of less than six hours per day, while 37 (33.9%) had a poor sleep efficiency of less than 75%. Subjective sleep quality was perceived to be poor in 33 (30.3%) of the study population. Fifty-nine (54.1%) had moderate to severe sleep latency in PSQI, derived from time to fall asleep and frequency of occurrence. Average time to fall asleep was more than 30 minutes in 30 (29.4%), while 81 (80.2%) could not fall asleep within 30 minutes at least once a week over the past one month. Out of the study population, 17 (15.6%) had used sleep medications at least once per week and 33 (30.3%) had mild-moderate day time dysfunction (Table 2).

Ninety-seven (89%) women experienced sleep disturbances during pregnancy, and 48 (44%) attributed the presence of leg cramps and muscle aches as the commonest cause (Figure 1).

Seventy six (75.2%) women had husband or another family member sleeping in the same bed, of whom 41 (54.5%) complained of loud snoring in subjects, but only 5 (6.5%) had observed them having long pauses of breathing during sleep. Fifty four (71.1%) had leg twitching during sleep, observed by their bed-partner at least once a week. Insomnia was noted among 40 (37.6%) women (Figure 2).

Poor overall sleep quality (PSQI score<5) was significantly associated with presence of foetal movements (14/15 vs 51/94, OR=11.8, 95% CI=1.5 - 93.5, p=0.003) and backache (18/22 vs 47/87, OR=3.8, 95% CI=1.2-12.3, p=0.027). Poor sleep duration of less than six hours was associated with the presence of one or more pregnancy related complications like HIP, GDM, FGR or psychological stress (14/30 vs. 16/79; OR=3.4, 95% CI=1.4-8.5, p=0.007). Poor sleep duration was also associated with an advanced maternal age of more than 35 years (12/30 vs 12/79; OR=3.7, 95% CI=1.4-9.7, p=0.007). However, the mean sleep durations did not significantly change with pregnancy related complications (6.0±2.0 vs 6.6±2.2 hours) or maternal age (5.8±2.9 vs 6.7±1.9 hours).

Table 1. Socio-demographic and pregnancy related characteristics of the study participants (N=109)

Variable	Category	Frequency (%)
Age Education	Advanced age (≥ 35)	23 (21.1%)
	Primary and secondary education	95 (87.2%)
	Tertiary Education and above	14 (12.8%)
Employment	Housewife	81 (74.3%)
	Employed	28 (25.7%)
Parity Gestational age	Primiparous	43 (39.4%)
	Late third trimester (Beyond 34 weeks)	90 (82.6%)
Pregnancy complications Weight gain during pregnancy at the time of study	Present	30 (27.5%)
	Less than 10kg	75 (68.8%)

Table 2. Components of sleep quality and excessive daytime sleepiness (N=109)

Variable	Category	Frequency (%)
Main components of sleep quality		
Sleep duration	Sleep duration <6 hours	30 (27.5%)
	Sleep duration ≥ 6 hours	79 (72.5%)
Subjective sleep quality	Very good	48 (44.0%)
	Fairly good	28 (25.7%)
	Fairly bad	28 (25.7%)
	Very bad	5 (4.6%)
Sleep latency	No sleep latency	17 (15.6%)
	Mild latency	33 (30.3%)
	Moderate latency	40 (36.7%)
	Severe latency	19 (17.4%)
Sleep efficiency	Very efficient (>85%)	57 (52.3%)
	Moderate efficiency (75-84%)	12 (11.0%)
	Mild efficiency (65-74%)	12 (11.0%)
	Not efficient (<65%)	25 (22.9%)
Overall sleep quality	Poor (PSQI Score >5)	65 (59.6%)
Day time somnolence	Excessive day time somnolence (Epworth Sleepiness Scale (ESS) >12)	29 (26.6%)

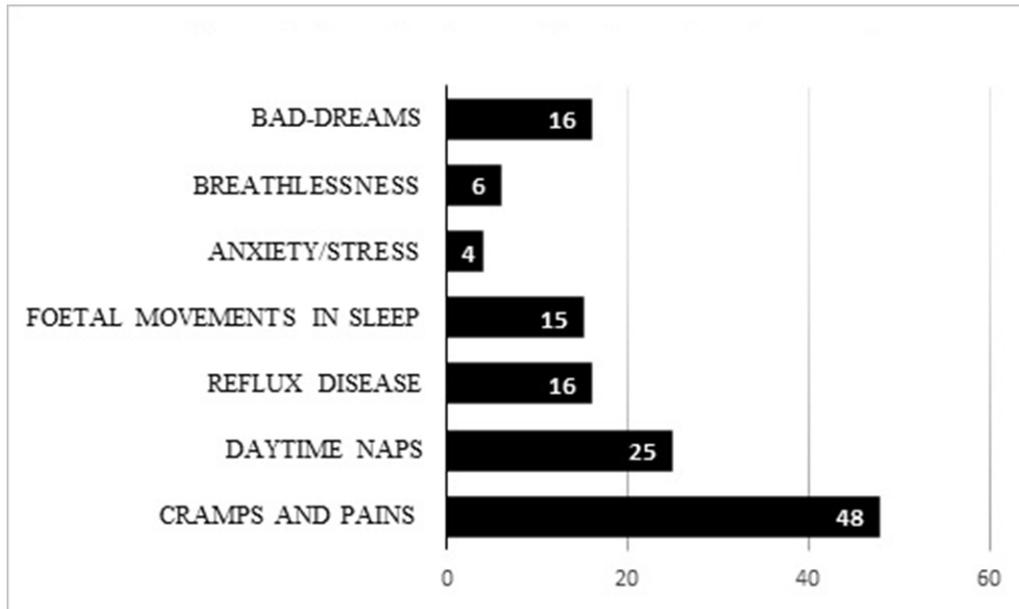


Figure 1. Perceived causes for sleep disturbances.

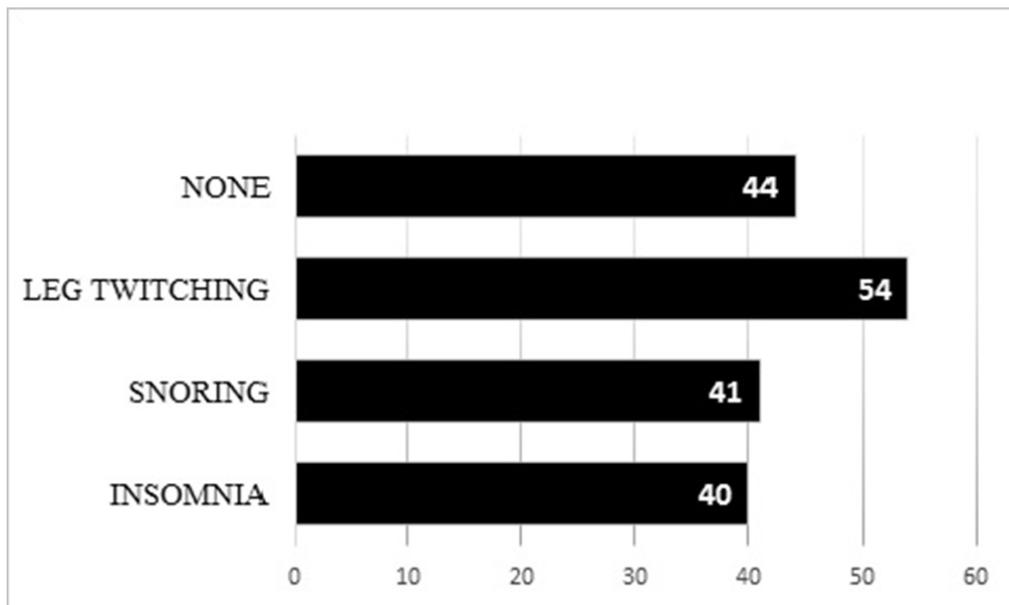


Figure 2. Sleep related problems in pregnancy.

Pregnant women were observed not to fall asleep within 30 minutes of going to bed, if beyond 34 weeks of gestational age (73/83 vs 8/18, OR=9.1, 95% CI=2.9-28.6, p<0.001) or if they had a weight gain of more than 10kg (30/32 vs 51/69, OR=5.3, 95% CI=1.2-24.4, p=0.030). However, the absolute weight of the participants at the time of the study did not demonstrate any association with sleep latency.

The time spent in bed was significantly lower among women with age more than 35 years (Mean±SD 7.9±1.5 vs 8.4±1.4 hours, p=0.044) and in women with tertiary education (Mean±SD 7.6±1.0 vs 8.4±1.4 hours, p=0.015). Primiparous women had significantly higher duration in bed compared to multiparous women with other children at home (Mean±SD 8.7±1.5 vs 8.0±1.3 hours, p=0.004). The overall sleep quality and

sleep duration were not associated with race, educational level, employment status, parity, or gestational age.

The median ESS score was 8 (IQR 4-11), and 29 (26.6%) of the pregnant women in their third trimester had EDS; defined as ESS score > 12. Those who were employed (12/28 vs 17/81, OR=2.8, 95% CI=1.1-7.1, p=0.045) and having tertiary education (8/14 vs 21/95, OR=4.7, 95% CI=1.5-15.1, p=0.010), had a significantly high day time somnolence. Breathlessness during sleep (4/6 vs 25/103, OR=6.2, 95% CI=1.1-36.1, p=0.042) was associated with EDS, though this was noted only among 6 (5.5%) mothers. Those with EDS had a significantly lower duration spent in bed when compared to those with no daytime somnolence (Mean±SD 7.9±1.4 vs 8.5±1.4 hours, p=0.012). The EDS was not associated with poor overall sleep quality or any other components of the PSQI. Age, gestational age, pregnancy weight gain or pregnancy related complications were also not associated with EDS. Insomnia was not associated with the presence of pregnancy related complications (33% vs 38%, p=0.824). However, those who experienced insomnia had a significantly higher PSQI score, indicating poor overall sleep quality compared to the group without insomnia (Mean±SD 7.2±3.7 vs 6.2±3.4, p=0.044).

Discussion

Our study gives evidence to the presence of poor sleep quality and EDS during T₃ using PSQI and ESS. In a cross-sectional study done among 7000 pregnant women in Poland, it was found that pregnant women who proclaimed to have better sleep quality in subjective assessment, had poor sleep quality when objectively assessed using PSQI¹⁶. Thus, the use of PSQI increases the validity and reliability of our study.

The prevalence of poor sleep quality (PSQI>5) varies across the trimesters¹², being the worst in T₃. In this study it was 59.6%, which keeps in-line with the findings of an American study having a prevalence of 44% in the T₃²⁷, however, is lower than that of 94.8% in Poland¹¹. The discrepancies may be due to differences in populations studied as well as subjectivity of assessment tools used. We found that poor overall sleep quality was associated with insomnia, presence of foetal movements and backache, which coincided with Polish studies showing sleep quality to be related to same^{10,12}. Sleep quality has also been found to be

associated with unemployment⁶, age, advancing gestation, parity¹³, socio-economic status^{5,14,15} and pregnancy related complications¹¹.

Subjective sleep quality, poor sleep efficiency and sleep disturbances were found to be more common in T₃^{16,17}, which was similar in this study. We elaborated on components of PSQI and their associated factors which have not been extensively studied previously. Increased sleep latency was related to advanced gestation and pregnancy weight gain. Kalmbach et al showed that weight gain was related to poor sleep quality⁹. The prevalence of poor sleep duration in T₃ was 27.5% with a median duration of 7 hours, in contrast to 7.5 hours reported by Hutchison et al⁷. We found sleep duration to associate with maternal age and pregnancy related complications, which keeps in line with previous studies^{7,18,19}. In this study 29.4% had poor sleep latency as opposed to 23.3% by Okun et al¹⁰.

In this study, 89% women experienced sleep disturbances, which keeps in line with 84% shown in Poland²⁸. Grigsby-Toussaint et al found over half of women had insomnia⁴, compared to 36.7% in our study. Insomnia was associated with pregnancy related complications here, but was not elaborated in previous literature. The prevalence of EDS (ESS>12) in this study was 26.5%, consistent with Izci et al who reported T₃ EDS prevalence of 23% in Scotland²⁹. We found a median ESS score of 8, in contrast to 9 by Grigsby-Toussaint et al⁴.

The EDS was previously known to be associated with age, trimester, parity, employment status, sleep disturbance and sleep duration²⁶. Some of our findings such as level of employment, time spent in bed and breathlessness are in line with above. Even though EDS is commonly attributed to presence of snoring, we did not find such association, which was similar to previous literature³. There was no association between pregnancy related complications and EDS, as also reported by Sarberg et al⁵.

We have not elaborated on employment to differentiate between desk jobs and activity-based jobs, and duration of employment which can be relevant to time spent in bed and sleep duration. An objective assessment of sleep related problems via polysomnography would yield a better diagnosis of sleep disorders, which was not undertaken here. Further research needs to determine sleep quality and EDS across all trimesters and their effects on the mother

and foetus. Future research can include both subjective and objective sleep diagnostic tools.

The results of our pilot study provide an important insight into the high occurrence of sleep related problems during pregnancy. Further research on community based larger sample is needed to determine the risk factors that contribute to poor sleep quality and EDS during pregnancy in Sri Lankan context, which in turn will help to identify mothers at risk and carry out appropriate intervention to offer them a better pregnancy outcome. Active screening of sleep related problems in pregnancy in the routine antenatal care should be encouraged and awareness should be created among the health care professionals involved.

Strengths and limitations

The objective use of validated PSQI and ESS improved the accuracy of results, and is a significant strength in this study. However the main limitation is that a suitable sample size was not calculated. Furthermore, it was a small convenience sample in an antenatal ward where only non-emergency admissions were recruited, but the majority would have had some obstetric reason to be admitted to the hospital, prior to the onset of labor, and therefore these women would not represent “normal pregnancies”. Nevertheless this could be considered as a pilot study with valid and important findings.

We only recruited mothers who were fluent in Sinhala because both questionnaires were validated only in Sinhala language. The four non-Sinhalese mothers were also fluent in Sinhala language and additionally the questionnaire was explained in detail to them.

Conclusions and recommendations

A majority (60%) of pregnant women in third trimester had poor overall sleep quality. Advanced maternal age, multiparity, advanced gestational age, pregnancy related complications, weight gain, backache and foetal movements were associated with poor sleep quality or its components.

Subjective sleep disturbances were common among 89% of mothers, with the commonest attribution being leg cramps and muscle aches. Excessive daytime somnolence was present in 26%, which was associated with maternal employment. Insomnia was seen among 38%, who had a higher PSQI score indicating comparatively poor overall sleep quality.

We recommend creating awareness among health staff caring for pregnant women, on the presence of poor sleep quality and related problems in late pregnancy, with a view to establishing, screening, monitoring, and management of sleep related disorders as part of routine antenatal care.

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Author contributions

DY, CU, CK and TA were involved in conceptualizing of the study. CK and CR were responsible for the clinical care of the patient. TA and DY did the data collection. FD and HS did the analysis and initial draft. All authors were involved in successive editing and finalizing of the manuscript.

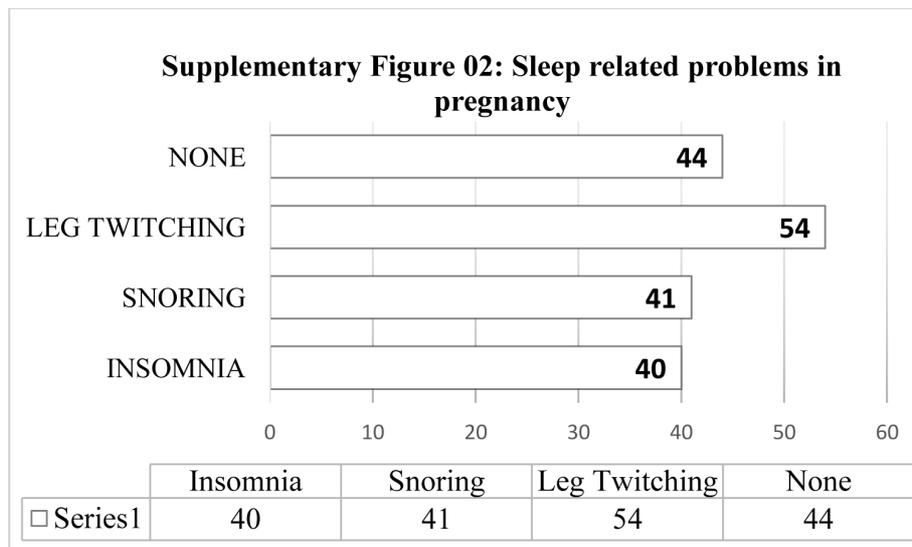
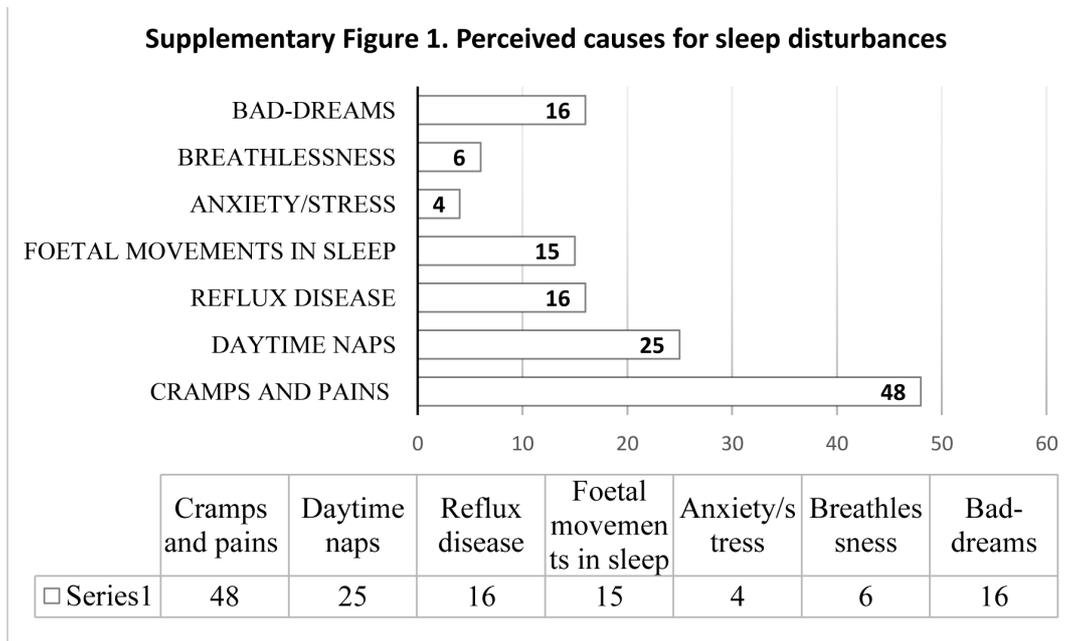
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Supplements



Supplementary Table: Associations between sleep quality and daytime somnolence with other related variables in the study population (N=109)

Variable	Variable	X ² /U value	Odds Ratio	P-Value
<i>Sleep quality and related variables</i>				
Sleep duration	Age	8.88	3.72	0.007
	Pregnancy related complications	7.61	3.44	0.007
Ability to fall asleep in 30 min	Early and late T ₃	17.63	9.125	0.000
	Weight gain during pregnancy	5.42	5.294	0.030
Sleep problems – insomnia Overall sleep quality	Pregnancy related complications	26.38	-	0.034
	Foetal movements at sleep	8.21	11.80	0.003
	Back pain	5.64	3.83	0.027
Overall sleep quality Time spent in bed	Sleep problems-insomnia	19.0*	-	0.044
	Age	694.5*	-	0.044
	Parity	912.0*	-	0.004
	Education level	375.5*	-	0.015
Day time somnolence	Education level	7.67	4.70	0.010
	Employment status	5.09	2.82	0.045
	Breathlessness	5.22	6.24	0.042
	Time spent in bed	765.0*	-	0.012

*U value from Mann-Whitney U test for the variables