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Pattern and Determinants of Sleep Quality among Pregnant Women Receiving Antenatal Care in a Tertiary Hospital

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ABSTRACT

Introduction: Nocturnal awakening which potentially impairs the quality of sleep as pregnancy progresses, may result from certain night-time habits, as well as a physiological increase in the frequency of micturition, sleep apnoea, and restless leg syndrome. Resultant poor quality of sleep may have adverse fetomaternal outcomes. This study was aimed at assessing sleep quality using validated tools among pregnant women seen in a tertiary care facility.

Methods: A cross-sectional study was performed among consenting antenatal care attendees, selected via systematic random sampling technique. Interviewer-administration of Pittsburgh Sleep Quality Index (PSQI) was used, Data was analyzed using SPSS version 24.0, with Chi-square, Fisher's Exact and independent t-tests employed as an inferential statistic, and p-value set at 0.05.

Results: The prevalence of low-grade sleep was 37.1%, with a mean PSQI score of 4.55 ± 1.54, The most affected sleep component with poor status was sleep disturbance (44.8%), followed by sleep latency (20.0%) and sleep duration (17.6%). Poor sleep quality was associated with each of the seven sleep components, grand multiparity, and perceived poor health status ($p<0.05$).

Conclusion: There is a significant proportion of unsatisfactory sleep quality among expectant mothers in the study location. Sleep hygiene should be incorporated into routine and follow-up ANC clinic visits, towards prevention of adverse fetomaternal outcomes.

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Introduction

Sleep is a biological cum physiological necessity crucial for the normal physical and mental functioning of the human body most especially during pregnancy [1]. Sleep is a multifaceted, complicated, methodical, and harmonized phenomenon that is indispensable for the renewal of mental and physiological abilities.

Pregnancy is linked to diverse physical, physiological, hormonal, emotional, and social changes which are capable of causing different forms of mental illness with both immediate and prolonged impacts [2]. Adequate sleep is essential for a positive pregnancy outcome. Most alterations in sleep patterns during pregnancy are usually due to hormonal and mechanical factors which may result from physical and cognitive changes that occur during pregnancy. Challenges such as lower limb stiffness, shortness of breath,

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heartburn, frequent voiding and unintentional urination, and severe headaches are some of the mechanical factors involved. The expanding uterus and exaggerated activity of the baby can prevent achieving the right position for sleep in some women [3,4]. Pregnancy is also associated with a significant increase in the level of hormones, including estrogen and progesterone, which are known to regulate a spectrum of bodily and cognitive responses, including sleep, mood, sensory, and mental functions [5]. Estrogen has been linked with swelling of the upper airway lining, resulting in increased airway impedance and respiratory distress. Oxytocin, in contrast, reaches its highest levels at night and can cause sleep interruptions in advanced pregnancy due to its effects on uterine contractions [5,6].

Previous studies have demonstrated that expectant women with inadequate sleep had a 20% higher risk of having a cesarean section and dysfunctional labor [7]. Inadequate sleep has also been associated with a higher likelihood of developing depression both during pregnancy and after childbirth [8,9].

Variables linked to inadequate sleep among gravid women include socioeconomic factors, advanced maternal age, primiparity, high body mass index, marital conflict, history of mental health issues, inadequate social support, unwanted conception, history of previous fetal demise, history of dysfunctional labor, history of chronic medical disorders (hypertension, diabetes mellitus), and low awareness of sleep hygiene practices [10,11].

Poor sleep standards and magnitude have both immediate and far-term maternal and perinatal repercussions, including cognitive difficulties and vulnerability to anxiety disorders and learning disabilities.

Despite the widespread occurrence and multiple challenges associated with poor sleep quality among expectant mothers, this subject is substantially under-recognized and poorly documented by caregivers as well as policymakers. The scope and configuration of unsatisfactory sleep experience and its predictive factors are poorly investigated in most developing countries. Hence, this study aims to determine the extent and pattern of sleep quality and associated factors among women attending the antenatal clinic at a tertiary hospital to institute appropriate interventions where necessary.

Materials and Method

Study design, population, and setting

The study design was cross-sectional and descriptive, undertaken among expectant mothers attending an antenatal care clinic in a tertiary care facility.

Sample size calculation

A sample size of four hundred and twenty (420), was calculated using the Cochrane formula [12] for a single proportion thus: [Zα/2 p*q] / d2, where Zα/2, standard normal deviate for 95% confidence interval =1.96; d, a margin of error = 0.05; p, the proportion of sleep disorder from previous study = 44.1%; q = 1-p; assumption of 10% dropout rate [13].

Eligibility

Consenting antenatal care clinic attendees that were 18 years or older, and with singleton gestation, were eligible to be recruited into the study. Pregnant women with gestational, type-1 or 2 diabetes mellitus, were ineligible to participate. Acutely ill pregnant women were ineligible. Also, ANC attendees receiving steroids, anticonvulsants, neuroleptics, benzodiazepines, and other medications that may impair sleep quality, were omitted from the research. Pregnant females with a recent background of addiction to caffeine, as well as those whose occupations involved occasional or routine night shifts, were also excluded.

Sampling

A structured random sampling protocol was used to enroll volunteers for this research from the ANC clinic. until the sample size was completed.

Instrument

The questionnaire used in this study comprised sections 1 and 2, which assessed sociodemographic and obstetric characteristics, as well as quality of sleep, respectively. The PSQI was used to appraise the quality of sleep in this study, It is a 19-item questionnaire with seven components assessed using a 4-point Likert scale response choice with each survey question having possible scores spanning from 0 to 3. The seven components comprise sleep latency, sleep duration, sleep quality, sleep disturbance, sleep efficiency, medication usage, and daytime dysfunction. Response to items in these components yields a sum score extending from 0 to 21. Good and inadequate sleep were indicated by a global score of ≤ 5 and >5, respectively.

Data collection

Data was collected from participants using a validated and pretested questionnaire after obtaining informed and written consent. Data

collection was carried out for ten (10) weeks.

Data analysis

Completed data was entered and processed using SPSS version 24.0. A frequency table was applied to display sociodemographic and obstetric characteristics, as well as relevant sleep quality characteristics. Normality testing of the PSQI score as a numerical value was done using the Kolmogorov-Smirnoff test. Average and standard deviation were used as measures of central location and variability, respectively. A histogram was used to display the frequency distribution of PSQI scores. The correlation between the overall sleep quality category and each component of sleep was assessed using Chi-square and Fisher's Exact test. These inferential statistics were also deployed to assess sociodemographic and obstetric factors associated with overall sleep quality, sleep disturbance, and sleep latency as key components of sleep. Independent t-test was used to compare means between two subgroups. P-value was set at 0.05.

Results

Four hundred and twenty (420) participants provided complete data with a response rate of 95.9%. Mean age was 30.1 ± 5.0 years, ranging from 16 to 44 years. Most participants were younger than 35 years (79.8%), had a tertiary level of education (71.0%), were business traders (63.6%), and Pentecostal worshipers (52.4%) (Table 1).

The mean gestational age was 26.5 ± 7.3 weeks, ranging from 5 to 40 weeks, while the majority (94.7%), which comprised approximately equal proportion, were in their second (47.1%) and third (47.6%) trimesters. Most participants were multiparous, while 20 (4.8%) were grand multiparous. Mean arterial blood pressure was 84.7 ± 10.5 mmHg, ranging from 60 to 117 mmHg, while sixty-two participants (14.8%) had abnormal blood pressure, comprising diastolic only (11.4%), systolic only (2.1%) and both (1.2%) forms of hypertension. Most participants (96.9%) perceived their health status to be excellent (46.7%) or good (50.2%) (Table 1).

Mean bedtime at night was 9.45 pm ± 1.03 hour, ranging from 8 pm to 12 am. The mean duration before falling asleep was 31.8 ± 5.7 minutes ranging from 5 to 180 minutes. The mean wake-up time was 6.44 am ± 1.16 hours, ranging from 4 to 9 am. The mean duration of night sleep was 9.0 ± 1.55 hours, ranging from 5 to 12 hours.

There was a normal distribution of PSQI score (Figure 1), with a mean score of 4.55 ± 1.54, ranging from 0 to 12.

One hundred and fifty-six (156) participants had poor sleep scores, yielding a prevalence rate of 37.1% (table 2).

The sleep component with the highest frequency of poor status was sleep disturbance (44.8%), followed by sleep latency (20.0%) and sleep duration (17.6%). Approximately one-

Table 1. Sociodemographic and obstetric characteristics of participants (N=420)

Variable	Frequency	Percentage
Age group (in years)		
<35	335	79.8
≥35	85	20.2
Total	420	100
Educational level		
Secondary	122	29.0
Tertiary	298	71.0
Total	420	100
Occupation		
Business/trader	267	63.6
Civil servant	111	26.4
Student	8	1.9
Unemployed	5	1.2
Others	29	6.9
Total	420	100
Religion		
Pentecostal	220	52.4
Roman catholic	95	22.6
Orthodox	66	15.7
Islam	8	1.9
Others	31	7.4
Total	420	100
Gestational age		
First trimester	22	5.2
Second trimester	198	47.1
Third trimester	200	47.6
Total	420	100
Parity		
Primiparous (0)	98	23.3
Multiparous (1-4)	302	71.9
Grand multiparous (≥5)	20	4.8
Total	420	100
Blood pressure		
Normal	358	85.2
Diastolic hypertension only	48	11.4
Systolic hypertension only	9	2.1
Both systolic and diastolic hypertension	5	1.2
Total	420	100
Perceived overall health status		
Excellent	196	46.7
Good	211	50.2
Fair	11	2.6
Poor	2	0.5
Total	420	100

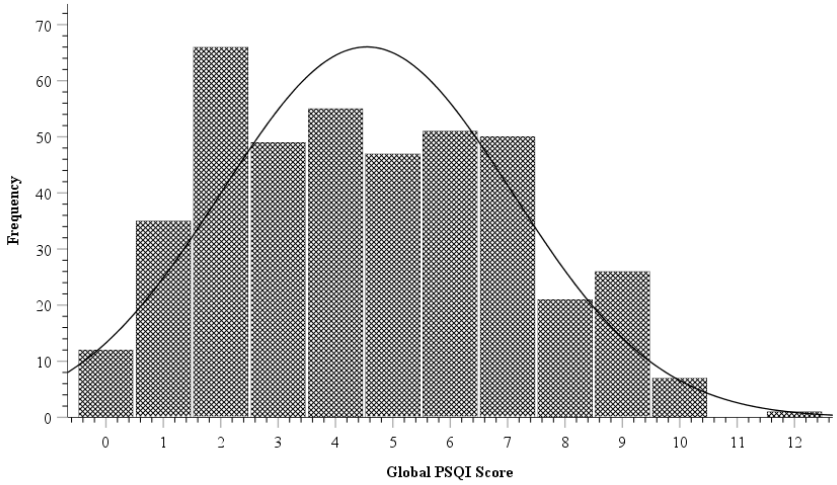

Figure 1. Histogram showing normal distribution of global PSQI score (N=420)

tenth each, had poor subjective sleep quality (10.5%), use of medications (11.4%), and daytime dysfunction (11.9%).

Table 2. Sleep characteristics among participants (N=420)

Component	Frequency	Percent
Subjective sleep quality		
Good	376	89.5
Poor	44	10.5
Total	420	100
Sleep latency		
Good	336	80.0
Poor	84	20.0
Total	420	100
Sleep duration		
Good (≥8 hours)	346	82.4
Poor (<8 hours)	74	17.6
Total	420	100
Sleep efficiency		
Good (≥85%)	393	93.6
Poor (<85%)	27	6.4
Total	420	100
Sleep disturbance		
Good	232	55.2
Poor	188	44.8
Total	420	100
Use of medications		
Good (less than once weekly)	372	88.6
Poor (once or more times weekly)	48	11.4
Total	420	100
Daytime dysfunction		
Good	370	88.1
Poor	50	11.9
Total	420	100
Overall sleep quality		
Good (PSQI score ≤5)	264	62.9
Poor (PSQI score >5)	156	37.1
Total	420	100
Mean ± SD (Range)	4.55 ± 1.54 (0-12)	

Poor sleep quality was associated with poor status of each of the seven components of sleep ($p<0.05$, table 3), as well as grand multiparity and perception of poor health status ($p<0.05$, table 4).

Poor sleep disturbance was also associated with grand multiparity. There was no significant relationship between sleep quality and other sociodemographic and obstetric characteristics including age, occupation, and blood pressure (table 4).

Discussion

Sleep is a natural recurring and rhythmic biological process marked by eyes closure and varying degrees of conscious awareness [14]. It is physiologic and necessary for all humans to sleep; more so in pregnant women who require adequate sleep to save their energy, remain in good health, and for proper development of their fetuses [15].

The proportion of dysfunctional sleep in this study was 37.1% which is comparable to a similar study done in our facility (44.1%) [16]. However, that study aimed to investigate the pattern and predictors of sleep disorders prevalent among the participants. The findings of this study were similar to that of a study done in Jinma, Ethiopia (30.8%), [17] and Vietnam (41.2%), [18] These results of this study exceeded those of a similar study done in China (15.2%), [19] and Peru (17%) [20].

However, the study findings indicated a reduced proportion of low-grade sleep compared with studies done in Poland (9%), [21] and Turkey (86%) [22].

The variations observed in the results of the studies may be due to differences in study design, sampling techniques, sample sizes,

socio-cultural characteristics, and inclusive and exclusive criteria of participants in different studies. This study revealed that dysfunctional sleep was connected with grand multiparty and perception of poor health status. Concerning the relationship between unsatisfactory sleep quality with grandmultiparity, this can be attributed to the fact that sleep excellence in pregnant females can be influenced by the presence of their young children at home. These young children usually demand considerable attention during the day and wake up/cry at night. In these cases, their mothers are usually considerably fatigued during the day and also wake up at night to attend to their needs. These usually impact negatively on their sleep value. This analysis is consistent with other research done in Northern Ethiopia,[23] Vietnam, [24] South Korea [25]. This study also showed an association between poor sleep quality and assessment of poor health concerns. Perception of poor health status could be due to perceived stress or co-morbidities in pregnancy. This is consistent with findings in studies done in Jimma Ethiopia, [17] Indonesia [26].

However, this study found no meaningful correlation between poor sleep quality and other socio-demographic and obstetric characteristics such as maternal age, and gestational age. This is an unusual finding but consistent with the findings in a study in India [27]. The study revealed that participants had unsatisfactory sleep quality in all the seven sleep components with the highest frequency being sleep disturbance (44.8%) followed by sleep latency. The other five sleep components had approximately one-tenth increase in frequency. This is consistent with findings in studies done in India, [28] and Turkey, [29] and Gondar Ethiopia, [30] where there was an increase in most or all the seven sleep components, though their relative frequencies vary. The relatively high prevalence and pattern of low-grade sleep in this research suggest that participants would benefit from the use of objective tests such as polysomnography or actigraphy to diagnose particular sleep disorders in the participants. These objective tests are expensive and not readily available in our environment. However, careful interpretation of the results obtained with PSQI questionnaires, the teaching of good sleep hygiene practices, and non-pharmacologic and pharmacologic therapy would help to greatly improve sleep quality among our pregnant women.

Conclusion

This study found a relatively high prevalence of dysfunctional sleep among expectant mothers which was associated with grandmultiparity and perception of poor health status. This study recommends regular assessment of sleep quality

Table 3. Relationship between overall sleep quality and each component of sleep (N=420)

Sleep component	Overall Sleep Quality		Total	Chi-square / FET
	Good (%) n	Poor (%) n	(n (100%	p-value
Subject sleep quality				
Good	261 (69.4)	115 (30.6)	376 (100)	0.00
Poor	3 (6.8)	41 (93.2)	44 (100)	
Sleep latency				
Good	245 (72.9)	91 (27.1)	336 (100)	0.00
Poor	19 (22.6)	65 (77.4)	84 (100)	
Sleep duration				
Good	219 (63.3)	127 (36.7)	346 (100)	0.69
Poor	45 (60.8)	29 (39.2)	74 (100)	
Sleep efficiency				
Good	259 (65.9)	134 (34.1)	393 (100)	0.00
Poor	5 (18.5)	22 (81.5)	27 (100)	
Sleep disturbance				
Good	205 (88.4)	27 (11.6)	232 (100)	0.00
Poor	59 (31.4)	129 (68.6)	188 (100)	
Use of medications				
Good	264 (71.0)	108 (29.0)	372 (100)	0.00
Poor	0 (0.0)	48 (100)	48 (100)	
Daytime dysfunction				
Good	262 (70.8)	108 (29.2)	370 (100)	0.00
Poor	2 (4.0)	48 (96.0)	50 (100)	

Table 4. Sociodemographic and obstetric factors associated with sleep quality (N=420)

Variable	Overall sleep quality		Sleep disturbance		Sleep latency	
	Good	Poor	Good	Poor	Good	Poor
Age group (in years)						
<35	206 (61.5)	129 (38.5)	185 (55.2)	150 (44.8)	273 (81.5)	62 (18.5)
≥35	58 (68.2)	27 (31.8)	47 (55.3)	38 (44.7)	63 (74.1)	22 (25.9)
Chi-square / FET p-value	0.25		0.99		0.13	
Mean ± SD	30.3 ± 4.9	29 ± 5.0	30.0 ± 5.0	30.3 ± 4.9	30.0 ± 4.8	30.8 ± 5.5
t-test p-value	0.25		0.57		0.17	
Educational level						
Secondary	68 (56.2)	54 (43.8)	60 (49.2)	62 (50.8)	93 (76.2)	29 (23.8)
Tertiary	196 (65.8)	102 (34.2)	172 (57.7)	126 (42.3)	243 (81.5)	55 (18.5)
Chi-square / FET p-value	0.09		0.11		0.22	
Occupation						
Civil servant	76 (68.5)	35 (31.5)	61 (55.0)	50 (45.0)	89 (80.2)	22 (19.8)
Business/trader	163 (61.0)	104 (39.0)	149 (55.8)	118 (44.2)	211 (79.0)	56 (21.0)
Student	7 (87.5)	1 (12.5)	6 (75.0)	2 (25.0)	7 (87.5)	1 (12.5)
Unemployed	3 (60.0)	2 (40.0)	0 (0.0)	5 (100)	5 (100)	0 (0.0)
Others	15 (51.7)	14 (48.3)	16 (55.2)	13 (44.8)	24 (82.8)	5 (17.2)
Chi-square / FET p-value	0.24		0.11		0.77	
Gestational age						
First trimester	14 (63.6)	8 (36.4)	13 (59.1)	9 (40.9)	20 (90.9)	2 (9.1)
Second trimester	121 (61.1)	77 (38.9)	101 (51.0)	97 (49.0)	148 (74.7)	50 (25.3)
Third trimester	129 (64.5)	71 (35.5)	118 (59.0)	82 (41.0)	168 (84.0)	32 (16.0)
Chi-square / FET p-value	0.78		0.26		0.03	
Mean + SD	26.6 ± 7.5	26.4 ± 7.0	26.7 ± 7.3	26.3 ± 7.3	26.6 ± 7.5	26.0 ± 6.5
t-test p-value	0.85		0.57		0.50	
Parity						
Primiparous (0)	48 (49.0)	50 (51.0)	41 (41.8)	57 (58.2)	71 (72.4)	27 (27.6)
Multiparous (1-4)	203 (67.2)	99 (32.8)	181 (59.9)	121 (40.1)	250 (82.8)	52 (17.2)
Grand multiparous (≥5)	**13 (65.0)**	7 (35.0)	10 (50.0)	10 (50.0)	15 (75.0)	5 (25.0)
Chi-square / FET p-value	0.01		0.01		0.07	
Mean ± SD	1.67 ± 1.04	1.44 ± 1.01	1.66 ± 1.05	1.47 ± 1.03	1.60 ± 1.03	1.50 ± 1.01
t-test p-value	0.17		0.16		0.52	
Blood pressure						
Normal	222 (62.0)	136 (38.0)	197 (55.0)	161 (45.0)	285 (79.6)	73 (20.4)
Abnormal	42 (67.7)	20 (32.3)	35 (56.5)	27 (43.5)	51 (82.3)	11 (17.7)
Chi-square / FET p-value	0.39		0.84		0.63	
MABP ± SD	84.8 ± 11.1	84.5 ± 9.5	84.7 ± 10.4	84.6 ± 10.6	84.5 ± 10.5	85.4 ± 10.4
t-test p-value	0.76		0.89		0.50	
Perceived health status						
Excellent	137 (69.9)	59 (30.1)	118 (60.2)	78 (39.8)	164 (83.7)	32 (16.3)
Good	120 (56.9)	91 (43.1)	104 (49.3)	107 (50.7)	163 (77.3)	48 (22.7)
Fair	7 (63.6)	4 (36.4)	8 (72.7)	3 (27.3)	9 (81.8)	2 (18.2)
Poor	0 (0.0)	2 (100)	2 (100)	0 (0.0)	0 (0.0)	2 (100)
Chi-square / FET p-value	0.01		0.05		0.01	

in expectant mothers and teaching good sleep hygiene practices regularly in our antenatal clinics. This will aid early diagnosis of poor sleep quality and enable timely interventions, thus improving fetal-maternal outcomes.

Limitations

This study was based on the face-to-face filling of a questionnaire that involved recalling events that occurred within the previous month. Thus, recall bias may be a problem for some of the volunteers. This was a snap-shot study and thus by its nature, a straightforward causal connection cannot be reported.

Conflict of interest

The authors declare no conflict of interest.

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