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Pregnant women's sleep quality and its associated factors among antenatal care attendants in Bahir Dar City, Northwest Ethiopia

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Good sleep quality is crucial for health and body equilibrium, particularly during pregnancy, where changes in sleep are influenced by mechanical and hormonal factors. Poor sleep can hinder daily activities and lead to adverse pregnancy outcomes. Data on sleep quality are scarce in low and middle-income countries such as Ethiopia. Hence, this study aimed to determine the magnitude of sleep quality and its associated factors among pregnant mothers in Bahir Dar City, northwest Ethiopia. A facility-based cross-sectional study was conducted with 367 randomly selected pregnant women. All pregnant women who attended public health facilities in Bahir Dar City from November 1st to December 30, 2022 were included except who were critically ill and aged less than 18 years. The data were collected through face-to-face interviews. Sleep quality was assessed by using the Pittsburgh Sleep Quality Index (PSQI). Stata v14 was used for data analysis. A binary logistic regression model was used to identify factors associated with poor sleep quality. Statistical significance was set at $p < 0.05$. The prevalence of poor sleep quality was 55.04%. In the multivariable analysis, older maternal age (AOR = 3.62), third trimester (AOR = 2.83), multigravidas (AOR = 2.55), low hemoglobin (AOR = 1.92), and coffee consumption (AOR = 2.19) were associated with poor sleep quality. More than half of pregnant women had poor sleep quality. Women aged ≥ 30 years, 3rd trimester, multigravidas, anemic women, and coffee consumption during pregnancy were factors associated with poor sleep quality. The concerned body should pay attention to improving Hgb level and iron/folate supplementation and reduce coffee intake in pregnant women to improve maternal sleep quality during pregnancy.

Keywords Sleep quality, Pregnant women, Bahir Dar, Ethiopia

Abbreviations

ANC	Antenatal Care
BMI	Body Mass Index
CI	Confidence Interval
EDS	Excessive Daytime Sleepiness
GSQ	Global Sleep Quality Score
Hgb	Hemoglobin
HSE	Habitual Sleep Efficiency
NREM	Non-Rapid Eye Movement
OSA	Obstructive Sleep Apnea
PSQI	Pittsburgh Sleep Quality Index
REM	Rapid Eye Movement
RLS	Restless Legs Syndrome
SD	Standard Deviation
SPSS	Statistical Package for Social Sciences
TGCSH	Tibebe Ghion Comprehensive Specialized Hospital

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Sleep quality is essential for normal growth and development of both the mind and body[1]. During pregnancy, adequate sleep is required for normal fetal growth and development[2]. Obtaining appropriate sleep provides the mother with the energy required for delivery. Poor sleep quality is associated with adverse outcomes during and after pregnancy and fetal well-being[3]. It also reduces quality of life and results in premature death[4–8].

Sleep is a basic requirement comprising the psychological, physiological, and social dimensions; thus, it affects health and health-related quality of life[9]. Pregnant mothers are at greater risk of developing sleep disturbance than the general population because pregnancy creates significant anatomical, physiological, biochemical, and hormonal changes in a woman's life[10,11,12–14,15,4,16]. There is also a marked increase in estrogen and progesterone levels during pregnancy[16,17]. In contrast, progesterone increases non-REM sleep and enhances the sensitivity of the respiratory center to carbon dioxide, which may protect against upper airway occlusion[18]. Oxytocin, the hormone responsible for uterine contractions, peaks at night, possibly causing sleep fragmentation during late pregnancy[19].

Previous studies indicated that more than two-thirds of women experience changes in sleep during pregnancy[20]. Global prevalence of poor sleep quality in pregnant women ranges from 15 to 96%[21,22,16,23,24,25]. Evidence suggests that sleep disorders may be associated with complications of pregnancy, such as gestational diabetes, gestational hypertension, preeclampsia, fetal growth disorders, preterm birth, and stillbirth[8,26]. Poor sleep quality during early pregnancy increases the risk of premature rupture of membranes by 12%[27].

Improving sleep quality is essential, and it requires attention from pregnant women, healthcare providers, and their support systems[27–29]. Strategies that can help enhance sleep quality include maintaining good sleep hygiene, practicing relaxation techniques before bedtime, creating a comfortable sleep environment, and seeking medical advice for any sleep disturbances[30–32]. These measures can mitigate the negative effects of poor sleep during pregnancy.

Despite the significant burden and complications of poor sleep quality among pregnant women, it remains unrecognized and undermined by healthcare workers in Ethiopia. Understanding the factors contributing to poor sleep quality, such as stress, depression, and sleep hygiene, helps healthcare providers in screening and early detection, allowing them to create personalized care plans. Data on poor sleep quality and its associated factors among pregnant women in low and middle-income countries, including Ethiopia, are scarce. Therefore, this study aimed to determine the magnitude of poor sleep quality and its associated factors among pregnant mothers in Bahir Dar, northwest Ethiopia.

Methods and materials

Study setting and population

A facility-based cross-sectional study was conducted in public health facilities in Bahir Dar City, northwest Ethiopia. Bahir Dar city is the capital of the Amhara National Regional State and is one of the metropolitan cities in the region with an estimated 406,434 total population (DHS, 2010). It is located 565 km northwest of Addis Ababa, Ethiopia. The city has three public hospitals (Tibebe Ghion Comprehensive Specialized Hospital (TGCSH), Felege Hiwot Comprehensive Specialized Hospital (FHCSH), and Addis Alem Primary Hospital) and ten health centers. These facilities serve an estimated eight million people. The study was conducted from November 1st to December 30, 2022. All pregnant women who attended public health facilities in Bahir Dar City during the study period were included. Pregnant women who were critically ill and aged less than 18 years were excluded from the study.

Sample size and sampling technique

The sample was calculated using a single population proportion formula with the following assumptions: the proportion of poor sleep quality was 68.4% in a study in Northern Ethiopia[33], a 95% confidence level, and a margin of error of 5%. Finally, we added a 10% non-response rate, and the final sample size was 367.

Of a total of thirteen public health facilities in Bahir Dar city (three hospitals and ten health centers), two hospitals, namely TGCSH and Addis Alem Primary Hospital, and four health centers, namely Bahir Dar, Han, Abay, and Shimbet health center were selected using a simple random sampling technique. The required sample size ($n = 367$) was allocated based on the previous month's flow rate of pregnant women for ANC utilization in health institutions. Additionally, a simple random sampling technique was employed to select study participants.

Data collection methods

A structured interview-administered questionnaire was administered. The Questionnaire contained socio-demographic characteristics, the Pittsburgh sleeping quality index (PSQI) to assess sleep quality[34], obstetrical and medical, and psychosocial factors. The PSQI is a 19-item self-report measure of sleep quality. The PSQI has seven subscale scores that measure subjective quality, latency, duration, habitual sleep efficiency (HSE), disturbance, medication use, and daytime dysfunction as they relate to sleep. These subscales were added to determine the global sleep quality score (GSQ). The GSQ score ranges from 0 to 21, with higher scores (PSQI >5) indicating poor sleep quality[34]. Substance use information of pregnant women, such as history of alcohol consumption, chat chewing, and cigarette smoking was collected one month before the study. Data were collected by three trained BSc midwives through interviews with women in a private room at discharge after receiving their health care. Additional obstetric and medical-related data were retrieved from the patients' medical records.

Measurements

Good sleep quality: is a state of having a PSQI score ≤5[16]. Poor sleep quality: is defined as a PSQI score > 5[34]. Substance use: Intentional ingestion of one or more psycho-stimulant drugs (alcohol, khat, or cigarette smoking)[35].

Data quality control

A validated structured questionnaire was used to measure the sleep quality. Training for data collectors was given for two days. The entire questionnaire, including the PSQI, was translated and adapted to the Amharic language. It was then retranslated back into English to ensure consistency and accuracy of the translation. The questionnaire was pre-tested on 5% of the sample at Felege Hiwot Comprehensive Specialized Hospital (FHCSH), with adjustments made based on the results. Its validity and reliability were then examined, with a Cronbach's alpha of 0.82 indicating good internal consistency. The supervisors checked the data daily for accuracy, consistency, and completeness.

Data processing and analysis

The collected data were checked for completeness, coded, entered into EpiData 4.6, and exported to STATA v14 for analysis. Factors associated with sleep quality were identified using a binary logistic regression analysis. All variables with $p < 0.25$ in the binary analysis were entered into the multiple logistic regression after checking for multicollinearity. Association was described using an adjusted odds ratio (AOR) along with its 95% Confidence Interval (CI). Finally, a p-value < 0.05 was used to declare a significant association.

Results

Socio-demographic characteristics

A total of 347 pregnant women were included in this study, with a response rate of 94.6%. The mean (± SD) age of pregnant women was 25.8 ± (3.93) years, with age ranges from 18 to 42 years. Regarding marital status and religion of participants, the majority were married and Orthodox, 330 (95.10%) and 271 (78.10%) respectively. Two hundred forty (69.16%) pregnant women attended high school education. One hundred forty-five (41.79%) of the participants' husbands were government employees, and 219 (63.11%) of them had a diploma and higher educational status. Regarding the place of residence, 88.76% of pregnant mothers lived in rural areas (Table 1).

*1USD ~ 54.90ETB

Pregnancy and comorbidities related characteristics

One hundred sixty-two (46.69%) pregnant mothers were in their 2nd trimester of pregnancy. More than three-quarters were multigravidas (77.81%) and (76.08%) were multiparas. Three hundred six (88.18%) pregnancies were planned. Fifty-seven (16.43%) of pregnant women had a history of pregnancy-related complications of any other type, and almost half (49.12%) of them had preeclampsia/eclampsia. Thirty (8.65%), 13 (3.75%), and 12 (3.46%) pregnant women had comorbidities such as hypertension, diabetes mellitus, and HIV/AIDS, respectively. Seventy-eight 22.48% of pregnant women were anemic. More than half (58.2%) of the participants did not initiate pre-conception folate supplementation. Regarding pre-pregnancy Body Mass Index, two hundred ninety (83.57%) pregnant women were in the normal BMI category (Table 2).

Substance use-related factors

The majority of pregnant women did not ever khat use, 339 (97.69%). Ninety-seven (27.95%) of pregnant women had a history of alcohol use; of which, 15 (15.46%) of them stated alcohol use in the past month. Regarding coffee consumption, from a total of 190 (54.76%) pregnant women who drank coffee, 153 (80.53%) of them had a once-daily coffee intake (Table 3).

The magnitude of poor sleep quality

The overall magnitude of poor sleep quality among pregnant women was 55.04% (95% CI 49.78–60.30%). Among the total respondents, 83 (23.92%) rated their overall sleep quality as very poor. More than two-thirds (69.16%) of the pregnant women had a minimum of 6 h of sleep duration per night. Almost all 337 (97.12%) pregnant women had never used sleeping medication for their sleep disturbance, and approximately a quarter (25.65%%) of pregnant women had more than 85% sleep efficiency (Table 4).

Factors associated with poor sleep quality

In the multivariable analysis, older maternal age (≥ 30 years), being in 3rd trimester of pregnancy, multigravidas, low hemoglobin, and coffee consumption during pregnancy were statistically associated with poor sleep quality.

The odds of having poor sleep quality among older pregnant women aged (≥ 30 years) were 3.62 times (AOR = 3.62, 95% CI (1.83–7.18) higher as compared with their counterparts. As the gestational age progressed, the odds of having poor sleep quality increased, as being in 3rd trimester of pregnancy was 2.83 times (AOR = 2.83, 95% CI 1.31–6.16) more likely to have poor sleep quality as compared to those in 1st trimester of pregnancy.

Moreover, the odds of having poor sleep quality among multigravida pregnant women were 2.55 times (AOR = 2.55, 95% CI 1.44–4.53) higher as compared with primigravida pregnant women. Pregnant women who had low Hgb levels (< 12 mg/dl) were 1.92 times (AOR = 1.92, 95% CI 1.07–3.44) more likely to suffer from poor sleep quality compared with those with normal Hgb levels. Furthermore, pregnant women who drank coffee were two times (AOR = 2.19, 95% CI 1.37–3.50) more likely to have poor sleep quality as compared to the non-coffee consumers (Table 5).

Discussion

Sleep is essential for fetal growth and development and is vital for ensuring a positive pregnancy experience[36]. Poor sleep quality during pregnancy can have various negative effects on both the mother and the fetus. It can increase the risk of complications such as gestational diabetes, preeclampsia, preterm birth, low birth weight, and a higher likelihood of requiring a cesarean delivery[28,37,38]. This study aimed to assess the magnitude of

Variables	Frequency	Percent (%)
Age (in years)		
18–24	112	32.28
25–29	159	45.82
≥ 30	76	21.90
Religion		
Orthodox	271	78.10
Muslim	56	16.14
Protestant	18	5.19
Catholic	2	0.58
Marital status		
Single	8	2.31
Married	330	95.10
Divorced	5	1.44
Widowed	4	1.15
Educational status (women)		
Unable to read and write	33	9.51
Primary	74	21.33
High school	99	28.53
Diploma and above	141	40.63
Educational status (Partner)		
Unable to read and write	13	3.75
Primary	34	9.80
High school	81	23.34
Diploma and above	219	63.11
Occupational status (women)		
Gov't employee	85	24.50
Private	57	16.43
Merchant	23	6.63
Farmer	13	3.75
Housewife	161	46.40
Others	8	2.31
Occupational status (partner)		
Gov't employee	145	41.79
Private	64	18.44
Merchant	78	22.48
Farmer	25	7.20
Daily laborer	22	6.34
Others	13	3.75
Mean monthly income (ETB)*		
< 3,073	81	23.34
≥ 3,073	266	76.66
Residency		
Urban	308	88.76
Rural	39	11.24

Table 1. Socio-demographic characteristics of pregnant women attending antenatal care services in Bahir Dar City ($n = 347$).

poor sleep quality and its associated factors among pregnant women in Bahir Dar, northwest Ethiopia. The present study found the magnitude of poor sleep quality was 55.04% (95% CI 49.78–60.30) among pregnant women. We found that older maternal age (≥30 years), being in 3rd trimester of pregnancy, multigravidas, low hemoglobin levels, and coffee consumption during pregnancy were statistically associated with poor sleep quality. The present findings on the magnitude of poor sleep quality are similar to studies in different countries such as China (51.9%)[39], Pakistan (53.3%)[23], Peru (52%)[40], Ethiopia, Nekemte (59.1%)[41], and Mettu (57.0%)[42].

This finding is lower than studies conducted in the USA (88%)[43], India (72.9%)[44], Turkey (88%)[45], and Debre Birhan Ethiopia (62.8%)[46]. The discrepancy might be related to the variation in the population for example in the Indian findings conducted among 3rd trimester pregnant women. In Turkey's study, the timing was during the COVID-19 pandemic, and data were collected through a self-administered online form, which could have

Variables	Frequency	Percent (%)
Pregnancy term		
1st trimester	41	11.82
2nd trimester	162	46.69
3rd trimester	144	41.50
Gravidity		
Primigravida	77	22.19
Multigravida	270	77.81
Parity		
Nullipara	83	23.92
Multipara	264	76.08
Current pregnancy status		
Planned	306	88.18
Unplanned	41	11.82
Previous history of complicated pregnancy		
Yes	57	16.43
No	290	83.57
Previous pregnancy complication type		
Antepartum/postpartum hemorrhage	12	21.05
Preeclampsia/eclampsia	28	49.12
Premature membrane rupture	10	17.54
Obstructed labor	7	12.28
Hypertension history		
Yes	30	8.65
No	317	91.35
Presence of HIV/AIDS		
Yes	12	3.46
No	335	96.54
Diabetes history		
Yes	13	3.75
No	334	96.25
Hemoglobin level		
< 12 mg/dl	76	21.90
≥ 12 mg/dl	271	78.10
Pre-pregnancy BMI (kg/m^2)		
< 18.5	14	4.03
18.5–24.9	290	83.57
25-29.9	28	8.07
> 30	15	4.32
Iron and folate supplementation		
Yes	202	58.21
No	145	41.79

Table 2. Pregnancy-related characteristics of women attending antenatal care services in Bahir Dar City ($n = 347$).

influenced the outcome. This might also be explained by the significant number of older (≥ 46 years) pregnant women in Debre Birhan's study.

However, the present findings were higher than those reported in Northwest Ethiopia (39.4%)[47], 42.2%[48] Iran (14.6%)[49]. USA 39.0%[50], Peru (17%)[51], Bangladesh, 38.9%[52], and Vietnam, 4.02%[53]. A possible explanation for this finding may be the variation in the use of different sleep quality assessment tools. Moreover, a study conducted in the USA focused solely on women in early pregnancy (6–20 weeks), while a study from Bangladesh exclusively included healthy pregnant women.

According to this study, older pregnant women are almost four times more susceptible to poor sleep quality during pregnancy than are younger women. This finding is supported by other studies carried out in different countries such as Ethiopia[33,35,46], Iran[54], Turkey[55], China[56], and the USA[50].

The above correlation could be explained by the fact that as people get older, problems associated with sleep quality are likely to become more severe[57], and women who are advanced in age typically have more responsibilities when it comes to household chores and taking care of others, which may cause them to feel

Variables		Frequency	Percent (%)
Khat use	Ever khat use		
	Yes	7	2.02
	No	340	97.98
	How long have you chewed khat? (year)		
	< 1	2	28.57
	1–5	4	57.14
	6–10	1	14.29
	How often do you chew khat?		
	Daily	2	28.57
	Weekly	5	71.43
	The amount you chew khat per day (gram)		
	25–50	5	71.43
	51–100	2	28.57
Alcohol use	Ever alcohol use		
	Yes	97	27.95
	No	250	72.05
	Type of alcohol you drink		
	Local drinks*	55	56.70
	Beer	42	43.30
	How long have you been drinking?		
	< 6 months	13	13.40
	6–11 months	19	19.59
	1–2 years	24	24.74
	> 2 years	41	42.27
	Current alcohol use (in the last 30 days)		
	Yes	15	15.46
	No	82	84.54
	How many liters did you drink per week?		
	≤ 1 lt.	20	20.62
	> 1 - <5 lt.	36	37.11
	≥ 5 lt.	41	42.27
Tobacco use	Ever smoking history		
	Yes	0	0.00
	No	347	100.00
	Does your partner smoke?		
	Yes	14	4.03
	No	333	95.97
	Did you/your partner smoke in the last 30 days?		
	Yes	0	0.00
	No	14	100.00
Caffeine use	Do you drink coffee currently?		
	Yes	191	54.04
	No	156	44.96
	How frequently did you drink per day?		
	Once daily	153	80.53
	Twice daily	30	15.79
	Thrice a day	7	3.68

Table 3. Substance use and related characteristics of women attending antenatal care services in Bahir Dar City ($n = 347$). *Tella, Tej, and local areke.

physical discomfort[26]. This may also be due to pre-existing health conditions that may be more common among older pregnant women, and a correlation between sleep patterns and the usual transformations that occur in adolescence and old age[58].

The study finding revealed that there is a significant association between gestational age and sleep quality. This means that as pregnancy progresses, sleep quality tends to worsen. Therefore, women in the third trimester

Variables	Frequency	Percent (%)
Subjective sleep quality		
Very good	124	35.73
Fairly good	140	40.35
Fairly bad	59	17.00
Very bad	24	6.92
Sleep latency		
0	72	20.75
1–2	145	41.79
3–4	87	25.07
5–6	43	12.39
Sleep duration in hours		
>7	118	34.01
6–7	122	35.16
5–6	71	20.46
<5	36	10.37
Habitual sleep efficiency		
≥85%	89	25.65
75–84%	159	45.82
65–74%	69	19.88
<65%	30	8.65
Sleep disturbance		
0	40	11.53
1–9	237	68.30
10–18	49	14.12
19–27	21	6.05
Use of sleep medication		
Never	337	97.12
< Once a week	8	2.31
Once/twice a week	2	0.58
≥3 times a week	0	0.00
Daytime dysfunction over the last month		
0	113	32.56
1–2	179	51.59
3–4	42	12.10
5–6	13	3.75
Overall Sleep Quality		
Good sleep quality	156	44.96
Poor sleep quality	191	55.04

Table 4. Sleep quality and its seven components score characteristics of women attending antenatal care services in Bahir Dar City ($n = 347$).

of pregnancy have a higher chance of experiencing poor sleep quality, which is nearly three times higher than women in the first trimester. This is in line with studies conducted in China[39], Ethiopia[33,46], and Turkey[6,9]. This is because as pregnancy progresses, women might find it more challenging to sleep due to physical discomfort, hormonal fluctuations, and anxiety about the upcoming birth. In addition, conditions such as restless leg syndrome and sleep apnea are more common in the later stages of pregnancy and can also contribute to poor sleep quality[10]. In addition, there is an increase in the proportion of changes seen in sleep patterns, ranging from 13 to 80% during the first trimester to 66–97% in the third trimester[59].

Moreover, the present study found a strong relationship between the number of times a woman became pregnant and sleep quality. This implies that women who have experienced pregnancies were 2.55 times more prone to have poor sleep quality than their counterparts. This is supported by studies conducted in Ethiopia[35,46] and South Korea[60]. A potential reason could be that women who expect a second child are relatively advanced in age and confront various kinds of stress from their familial, professional, or even societal relations. As a result, they are more prone to experiencing unwanted psychological feelings such as pessimism, unease, and gloominess and subsequently encounter sleep disturbances[40,61,62].

Furthermore, low hemoglobin level was identified as a factor associated with poor sleep quality. The study found that poor sleep quality was 1.92 times more common in pregnant women with low hemoglobin levels than in women with normal hemoglobin levels. This is consistent with research conducted in India[44] and Turkey,

Variables	Category	Sleep Quality		COR, (95% CI)	AOR, (95% CI)
		Good	Poor		
Age	18–24 year	63	49	1	1
	25–29 year	74	85	1.47 (0.91, 2.40)	1.51 (0.89, 2.57)
	≥ 30 years	19	57	3.88 (2.03, 7.31)	3.62 (1.83, 7.18) *
Gestational age	1st trimester	24	17	1	1
	2nd trimester	81	81	1.41 (0.70, 2.82)	1.61 (0.76, 3.44)
	3rd trimester	51	93	2.57 (1.27, 5.23)	2.83 (1.31, 6.16) *
Gravidity	Primigravida	50	27	1	1
	Multigravida	106	164	2.87 (1.69, 4.86)	2.55 (1.44, 4.53) *
Hemoglobin level	< 12 mg/dl	24	52	2.06 (1.20, 3.53)	1.92 (1.07, 3.44) *
	≥ 12 mg/dl	132	139	1	1
Coffee use	Yes	67	124	2.46 (1.59, 3.80)	2.19 (1.37, 3.50) *
	No	89	67	1	1

Table 5. Factors associated with poor sleep quality among pregnant women attending antenatal care services in Bahir Dar City ($n = 347$). *$p < 0.05$, Hosmer-lemshow test = 0.8197.

which revealed that there is a statistically significant increase in the number of people who suffered from iron deficiency anemia and reported poor sleep quality[63]. Iron deficiency can lead to alterations in the metabolism of neurotransmitters, which may have negative effects on psychological well-being and disrupt sleep by triggering restless legs syndrome (RLS)[64]. Evidence supports the multifaceted impact of iron on dopamine function in the brain. Dopamine-mediated modulation of the nervous system plays a significant role in regulating sleep patterns, including the quality, amount, and timing of rapid eye movement (REM) sleep[65–67].

In addition, coffee/caffeinated substances during pregnancy negatively affect sleep quality, with a two-fold higher risk of poor sleep quality than those who don't consume coffee. Similar finding was observed in studies conducted in Gondar[48], and Turkey[68]. This may be related to the fact that drinking coffee can impact sleep quality as it contains caffeine. Caffeine is known for its potent effect on adenosine receptors, which are responsible for regulating sleep, cognitive function, and brain arousal. Therefore, coffee consumption can reduce the overall quality and duration of sleep[69–71].

Evidence showed that improving pregnant women's sleeping quality associated with decreased complications of pregnancy, such as gestational diabetes, gestational hypertension, preeclampsia, fetal growth disorders, preterm birth, and stillbirth[8,26]. Therefore, police maker should have to develop a guideline and protocols for healthcare providers to assess pregnant women's sleeping quality as part of routine antenatal care. Future longitudinal studies should explore effectives of interventions to improve sleeping quality during pregnancy and its prevention of maternal and neonatal complications.

Limitations

This cross-sectional study didn't establish a cause-and-effect relationship between sleep quality and potential risk factors. This was a subjective assessment of sleep quality, and some of the information required participants to recall, which could lead to recall bias. Another limitation of the study was that birth outcomes were not assessed, which could enable a better understanding of the effects of poor sleep quality on pregnancy.

Conclusion

In conclusion, the magnitude of poor sleep quality among pregnant women is relatively high. Women aged ≥ 30 years, 3rd-trimester pregnancy, multigravidas, low hemoglobin, and coffee consumption during pregnancy were associated with poor sleep quality among pregnant women. Prompt detection and screening of sleep problems are essential to improve maternal sleep quality and health status. Moreover, we recommend providing special concern for those pregnant women with 3rd-trimester pregnancy, higher coffee consumption to be screened for sleep problems as early as possible, and pregnant women must give attention to iron/folate supplementation and hemoglobin.

Data availability

All data of this study is available from the corresponding author upon reasonable request.

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Author contributions

SA, AD, and AKT designed the study. SA led the data collection and analysis under the supervision of AD and AKT. UJ and AD drafted the manuscript under the supervision of AKT. SA, AD, UJ, and AKT reviewed the manuscript for intellectual content. All authors read and approved the final version of the manuscript.

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Declarations

Competing interests

The authors declare no competing interests.

Ethics approval and consent to participate

This study was conducted in accordance with the declaration of Helsinki. The study was ethically cleared and approved by the Ethical Review Committee of the Haramaya University College of Health and Medical Science (Ref. No: IHRERC/198/2022). Following approval, an official written letter of cooperation was given to the administrative health bureau and facilities. Written informed consent was obtained from each pregnant woman. Confidentiality was ensured throughout the process.

Additional information

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