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Poor sleep quality and associated factors among pregnant women on antenatal care follow up at Nekemte Referral Hospital and Wollega University Hospital, Nekemte, Ethiopia, 2019: a cross-sectional study

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Abstract

Sleep disturbances are common in women, especially during pregnancy. This can result in emotional and psychological consequences for pregnant women, and it could lead to some serious complications for both mothers and their babies. However, it is not well recognized and has not been studied in developing countries, including Ethiopia.

Objective

To assess the quality of sleep and associated factors among pregnant women on antenatal care follow-up at Nekemte Referral Hospital and Wollega University Hospital, Nekemte, Ethiopia 2019.

Methods

An institution-based cross-sectional study was conducted from May to June 2019 at Nekemte Referral Hospital and Wollega University Hospital. A systematic random sampling technique was used to get 408 samples. Sleep quality was assessed using structured questionnaires of the Pittsburgh Sleep Quality Index tool. Then, the collected data was coded and entered into Epi-Data 3.1 version and analyzed using SPSS version 20. A logistic regression analysis was computed to determine the association between independent variables and sleep quality. Statistically significant was considered at *P*-value < 0.05.

Results

With 96.4% response rate, the magnitude of poor sleep quality was found to be 59.1% [95% CI: (54.2, 64)]. Poor sleep quality was high among participants with unplanned pregnancy [AOR = 4.25,95%CI:(1.47,12.23)],poor sleep hygiene[AOR = 2.93,95%CI:(1.41,6.09)],depressed women[AOR = 5.73,95%CI:(2.49,13.21)], anxiety disorder[AOR = 6.62, 95%CI:(2.61,16.82)] and third trimester participants [AOR = 5.84,95% CI:(2.49,13.21)].

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Conclusion

This study demonstrated that poor sleep quality among pregnant women is high. Factors like depression, anxiety, poor sleep hygiene, first time pregnancy, unplanned pregnancy, and late gestational age were found to be associated with poor sleep quality. This underlines health care planners' needs to incorporate screening for poor sleep quality into routine ANC services.

Keywords: Sleep quality, Pregnant woman, Ethiopia

Introduction

Sleep is a systematic and organized behavior that is routinely repeated based on biological rhythms and significantly contributes to the reactivation of mental and physiological power and is required for accepting new tasks and roles (Abiola et al. 2013).The requirement for sleep varies between individuals depending on age, gender, diet, physical activity, health status, and other personal factors (Brown et al. 2002). Poor sleep quality is characterized by an inability to fall asleep within 30 min, wake up more than once during the night, or when it takes more than 20 min to drift back asleep after waking up from sleep (Buysse et al. 1989). Currently, about 17% of the populations in developing countries and 20% of the population in developed countries are suffering from sleep problems (Chang et al. 2010).

Pregnancy is a process that creates significant anatomical, physiological, and biochemical changes in a woman's life (Chung et al. 2014). In this period, pregnant women need adequate sleep for the normal growth and development of the fetus. Adequate sleep during pregnancy gives them the energy that they need for their labor and delivery process (Da Costa et al. 2010). However, sleep disturbances and sleep disorders are common during this period (Ejeta et al. 2015; Huong 2019; Huong and Thuy 2018).

According to the National Sleep Foundation Women and Sleep poll, 79% of pregnant women suffer from sleep disorders (JAHDI et al. 2013). Sleep disturbances have been observed right from the first trimester of pregnancy until the end of the third trimester. However, the percentage of sleep disorders and sleep disturbances is higher in the third trimester of pregnancy (Kloss et al. 2015; Ko et al. 2010). Empirical research indicates that up to 25% of pregnant women report significant sleep disturbance in the first trimester, with rates climbing to nearly 75% by the third trimester (LeBourgeois et al. 2005).

Many studies state that pregnant women's sleep quality may be faced with some challenges due to the systematic change caused by hormonal, psychological, and physical factors that happen during pregnancy (Lee et al. 2000).Physiological changes such as increased progesterone and prolactin levels, increase in body size, fetal movement, and bladder distention can potentially explain some of the disturbances to a pregnant woman's sleep (Lee and Baratte-Beebe 2001).

Multiple psychological factors, including depression, anxiety, and stress, can pose troubles to sleep cycles, leading to sleep disorders, because the relationship between each of these factors and sleep quality has been confirmed in some studies (Medicine 2005). Depression during pregnancy affects the ability of self-care, the quality of diet and sleep, and ignorance of medical advice (Buysse et al. 1989). On the other hand, someone with anxiety and worries would be obsessed with recurring thoughts concerning negative events that there is the possibility of their happening, which is shared by pregnant women concerning their children's future and it affects their sleep quality (O'Brien 2012). In particular, sleep hygiene practices have a great effect on sleep quality according to some research studies (Reshadat et al. 2018; Reutrakul et al. 2011).

Any changes in pregnant women's quality of sleep may influence their attitudes towards experiencing labor pains and acceptance of the maternal role (O'Brien 2012). Poor sleep quality is associated with adverse pregnancy outcomes both in mother and fetus, such as low birth weight, preterm baby delivery, intra uterine growth retardation, low APGAR score, and still birth in the fetus and newborn (Rezaei et al. 2014).There are also increased maternal complications during pregnancy like preeclampsia, gestational diabetes, as well as increased complications during delivery like prolonged labor and caesarean section deliveries (Rezaei et al. 2014).

Prenatal care services are designed to enable pregnant women to undergo pregnancy with the minimum possible complications. Thus, regarding the necessity of examination of the quantity and quality of sleep, it is important to identify and follow-up the problems in this period (Buysse et al. 1989).

Although some studies have assessed sleep quality during pregnancy and its effects, most of these studies were carried out only in the western population, and no study has been done in Ethiopia. The aim of the current study was to assess the quality of sleep and associated factors among pregnant women in Nekemte Referral Hospital

and Wollega University Hospital with a view to informing the development of appropriate intervention.

Methods

An institution-based cross-sectional study was conducted from May to June 2019. The study was conducted at Nekemte referral hospital and Wollega University hospital, which are located in Nekemte town, East Wollega zone. It isabout 331 km to the West of Addis Ababa, the capital city of Ethiopia. On average, about 1015 pregnant women visit ANC follow-up each month at Nekemte Referral Hospital and 525 pregnant women each month at Wollega University Hospital. Totally about 1,540 pregnant women visit ANC follow-up in both hospitals monthly (Sahota et al. 2003).

All pregnant women who were on ANC follow-up at Nekemte Referral Hospital &Wollega University Hospital were considered as source population. Pregnant women who were available during the data collection period were the study population. All pregnant women who were on ANC follow-up and older than 18 years were included. Participants who were critically ill and those who had verbal communication problems were excluded from this study.

The required number of samples for this study was determined by using a single population proportion formula considering the following assumptions: standard normal distribution with a confidence interval of 95% (Z = 1.96), absolute precision or tolerable margin of error (d = 0.05), and since the proportion of sleep disorders for pregnant women is unknown in Ethiopia ($P = 50\%$). Thus, by adding 10% nonresponse rates, the final calculated sample size was 423.

A systematic random sampling technique was employed to select study participants. The sampling interval was determined by dividing the total number of pregnant women who were on follow-up during a month of data collection in both hospitals by the sample size from each hospital after proportional allocation. For analysis, data were entered into EPI-DATA version 3.1.5 and exported to SPSS version 20. Bivariate analysis was performed to determine the effect of each factor on the outcome variable. Only factors with a p-value < 0.25 on bivariate analyses were kept for multivariate logistic regression, and p-value < 0.05 on multivariate analyses was considered as statistically significant.

Sleep quality was assessed by using the Pittsburgh Sleep Quality Index (PSQI), which is a widely used instrument for assessing sleep quality. It is a self-reported instrument comprised of 19 items evaluating seven components of sleep over the past month, such as: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, daytime dysfunction, and use of sleep medications. Each component is scored ranging from 0 to 3, and a total global PSQI is derived by summing the seven component ranges: 0 to 21; with higher scores (PSQI score > 5) indicating poor sleep quality. It has a diagnostic sensitivity of 89% and a specificity of 86.5 in distinguishing "good" from "poor" sleepers (Brown et al. 2002).

Depression, anxiety, and stress were measured using Lovibond's short version of the DASS-21. DASS-21 is a psychological screening instrument that is capable of differentiating symptoms of depression, anxiety, and stress. Each domain comprises seven items assessing symptoms of depression, anxiety, and stress. Each of the questions had four options: never (0), low (1), average (2), and high (3). Scores from each dimension were summed up, and the final score was multiplied by 2. Accordingly, for DASS-21 D; score > 9 categorized as depressed, for DASS-21A; score > 7 categorized as anxious, and for DASS-21S; score > 14 categorized as stressed. This questionnaire was studied in Iran, and the test–retest reliabilities for depression, anxiety, and stress were 0.80, 0.76, and 0.77, and the alphas were 0.81, 0.74, and 0.78, respectively (Buysse et al. 1989).

Sleep hygiene was assessed by using the sleep hygiene index (SHI), which is a 13-item self-reported measure designed to assess the practice of sleep hygiene behaviors. Each item is rated on a five-point scale ranging from 0 (never) to 4 (always). Total scores range from 0 to 52, with a higher score (> 16) representing poor sleep hygiene (Chang et al. 2010). Social support was measured using the Oslo 3 item social support scale (OSS-3), which is a poor social support-a score of "3–8", an intermediate social support-a score of "9–11", and strong social support-a score of "12–14" (Chung et al. 2014).

The questionnaire was initially prepared in English, translated to the local languages of Afaan Oromo, and Amharic, and retranslated to English by another person who was blind to the original questionnaire for consistency checks.

Operational Definitions

Poor sleep quality is explained by a cut-off point of greater than 5 by using the PSQI Screening tool (Sedov et al. 2018).

Good sleep quality is explained by a cut-off point of less than or equal to 5 by using the PSQI Screening tool (Sedov et al. 2018).

Ethical consideration

Ethical approval was obtained from the joint ethical review committee of the University of Gondar and Amanuel Mental Specialized Hospital. The data collectors were clearly explained the aims of the study to the study

participants. Data was collected after obtaining verbal or written consent from each participant. The right was given to the study participants to refuse or discontinue participation at any time they wanted, and they had the chance to ask anything about the study. For anonymity, the participant's name was not used at the time of data collection, and all other personnel information was kept entirely anonymously and confidentiality was assured throughout the study period.

Results

A total of 408 participants were included in the study, with a response rate of 96.4%.

Sociodemographic Characteristics of Respondents

The majority of respondents were between (Shariat et al. 2017; Shariat et al. 2017; Stranges et al. 2012; Sun et al. 2017; Taskiran 2011; Venugopal et al. 2018) age groups and 390 (95.6%) were married. The educational status indicated that 139 (34.1%) and 129 (31.6%) of the participants attended primary and secondary school, respectively. According to the World Bank classification of poverty line scale, 154 (37.7%) of the participants earn an average monthly income < 1627 ETB (see Table 1).

Obstetric characteristics of respondents

Obstetric characteristics of the participants indicate that 196 (48%) were in their second trimesteand 162(39.7%) were on their first visit. Moreover, 237(58.1%) of participants were multigravida and 227(55.6%) were multiparous (see Table 2).

Table 1 Distribution of respondents by sociodemographic characteristics at Nekemte Referral Hospital and Wollega University Hospital, Nekemte, Ethiopia, 2019 ($n = 408$)

Variables	Category	Frequency (N = 408)	Percent (%)
Age	18–23	138	38.8
	24–29	212	52
	≥ 30	58	14.2
Marital status	Married	390	95.6
	Others	18	4.4
Educational status	Unable to read and write	68	16.7
	Primary(1–8)	139	34.1
	Secondary(10–12)	129	31.6
	College and above	72	17.6
Occupation	House wife	190	46.6
	Private worker	120	29.4
	Employed	55	13.5
	Daily labor	43	10.5
Monthly Income	< 1627ETB	154	37.7
	> 1627ETB	254	62.3

Others (Divorced, widowed, separated) 1USD ~ 28.54ETB

Table 2 Obstetric characteristics of participants on ANC follow-up at Nekemte Referral Hospital and Wollega University Hospital, Nekemte, Ethiopia, 2019 *(n = 408)*

Variables	Category	Frequency	Percent (%)
Number of ANC visit	Frist	162	39.7
	Second	122	29.9
	Third	70	17.2
	Fourth	54	13.2
Gestational age	1st trimester	79	19.4
	2nd trimester	196	48
	3rd trimester	133	32.6
Gravida	Primigravida	171	41.9
	Multigravida	237	58.1
Parity	Nullipara	134	32.8
	Primipara	47	11.5
	Multipara	227	55.6

Psychosocial characteristics of participants

Among the study participants, 160(39.2%) had poor social support, 125(30.6%) were depressed, and 136(33.3%) had stress. Additionally, 129(29.7%) had anxiety, and 371 (90.9%) had planned pregnancies (see Table 3).

The correlation between variables was indicated as follows: depression and anxiety, depression and stress, anxiety and stress had (0.826, 0.590, and 0.634) correlations, respectively. Social support was negatively correlated with other variables, such that social support and depression had a -0.301 correlation, social support and anxiety had a -0.287 correlation, and social support and stress had a -0.357 correlation.

Pregnancy intention and social support had -0.009 correlation, pregnancy intention and depression had a 0.031 correlation, pregnancy intention and anxiety had a 0.190 correlation, Pregnancy intention and stress had a 0.066 correlation. And, sleep hygiene and depression,

Table 3 Psychosocial characteristics of respondents on ANC follow-up at Nekemte referral hospital and Wollega University hospital, Nekemte, Ethiopia, 2019 ($n = 408$)

Variables	Category	Frequency	Percent (%)
Social support	Poor	160	39.2
	Medium	134	32.8
	Good	114	27.9
Depression	No	283	69.4
	Yes	125	30.6
Anxiety	No	287	70.3
	Yes	121	29.7
Stress	No	272	66.7
	Yes	136	33.3
Pregnancy intention	Planned	371	90.9
	Unplanned	37	9.1

sleep hygiene and anxiety, and sleep hygiene and stress had (0.608, 0.675, and 0.521) correlations, respectively.

Participants' characteristics by clinical and behavioral factors

Among the total participants, 193 (47.3%) complained of back pain, 15 (3.7%) had chronic illness, 137 (33.6%) had poor sleep hygiene, and 17 (4.2%) consumed alcohol within three months of the data collection period.

The magnitudes of poor sleep quality

In the current study, the magnitude of poor sleep quality among pregnant women was 241 (59.1%) according to the global PSQI > 5. Seven components of sleep quality in the present study were assessed and identified as their sleep status. Only 16 (3.9%) of the participants reported that their subjective sleep quality was very bad, and 6 (1.5%) had a problem with a sleep latency of more than an hour. About 256 (61.8%) reported that they had less than 7 h of sleep per night, and 148 (36.3%) had low habitual sleep efficiency (65%). Moreover, 70 (19.1%) had sleep disturbance once or twice per week, 22 (5.4%) used sleep medication, and 106 (26%) of the participants reported daytime dysfunction once or twice per week within the past one month at the time of interview (see Table 4).

The percentage of poor and good sleep quality was done for the three trimesters among pregnant women and it was indicated in the following figure (see Fig. 1).

Factors associated with poor sleep quality among pregnant women

Bivariate logistic regression analysis was done for each of the independent variables and the outcome variable. Variables like socio-demographic variables (age and occupation), obstetric variables (gestational age and gravida), behavioral and psychosocial factors (sleep hygiene, pregnancy intention, depression, anxiety, stress, and social support) fulfilled the minimum requirement ($p < 0.25$) for multivariate logistic regration analysis.

In multivariate analysis, factors like depressive symptoms, poor sleep hygiene, first-time pregnancy, anxiety symptoms, unplanned pregnancy, and late gestational age were significantly associated with poor sleep quality (See Table 5).

Table 4 Sleep quality and its component scores among pregnant women attending ANC follow-up at Nekemte Referral Hospital and Wollega University Hospital,Nekemte, Ethiopia, 2019($n = 408$)

Variables		Frequencies	Percentage
Subjectivesleep quality	Very good	104	25.5
	Fairly good	168	41.2
	Fairly bad	120	29.4
	Very bad	16	3.9
Sleep latency	≤ 15 min	30	7.4
	16-30 min	235	57.6
	31-60 min	137	33.6
	> 60 min	6	1.5
Sleep duration	> 7 h	156	38.2
	6-7 h	133	32.6
	5-6 h	95	23.3
	< 5 h	24	5.9
Sleep efficiency	≥ 85%	106	26
	75–84%	82	20.1
	65–74%	72	17.6
	< 65%	148	36.3
Sleep disturbance	none	62	15.2
	< 1 /week	268	65.7
	1–2 / week	70	19.1
	3 or more /week	0	0
Use of sleep medicine	Never	386	94.6
	< once a week	17	4.2
	1–2 times per week	5	1.2
	≥ 3 times per week	0	0
Day time dysfunction	Never	78	19.1
	< once a week	224	54.9
	1–2 times per week	106	26
	≥ 3 times per week	0	0
PSQI total score	Good sleep	167	41.9%
	Poor sleep	241	59.1%

Discussion

The magnitude of poor sleep quality in this study was 59.1% (95%CI: 54.2, 64). This finding showed a similar prevalence to the results of other studies conducted among pregnant women in Turkey (61%) (Abiola et al. 2013) and in Chicago (64%) (Brown et al. 2002). However, the result of the present study was higher than studies conducted in China (15.2%) (Buysse et al. 1989), India (24.4%) (Chang et al. 2010), Vietnam (41.2%) (Chung et al. 2014) and Canada (45.7%) (Da Costa et al. 2010) and it is lower than studies conducted in Iran (88.5%, 87.2%, 75.26%) (Ejeta et al. 2015; Huong 2019; Huong and Thuy 2018)and Turkey 86% (JAHDI et al. 2013). The possible reason might be the difference in characteristics of the study population, such that only healthy individuals were involved from Vietnam and India, and only third-trimester pregnant women participated from Iran (Ejeta et al. 2015). Another possible reason for this difference might be variation in sample size, socio-cultural, and study settings.

This study shows a significant association of gestational age; first pregnancy, unplanned pregnancy, depression, anxiety, and poor sleep hygiene with poor sleep quality. In the present study, a significant association between gestational age and sleep quality was discovered. The odds of developing poor sleep quality were 5.84 times higher for the thirdtrimester and more than two times higher for the second trimester than for the first trimester

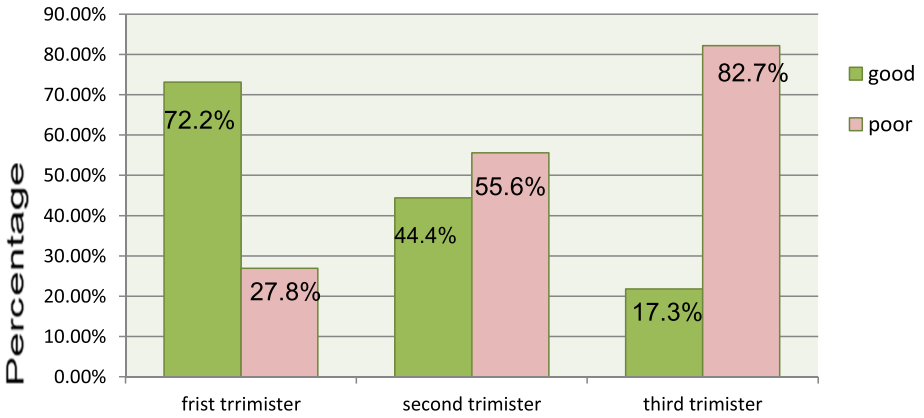

Fig. 1 Figure showing the percentage of poor and good sleep quality across the three trimesters among pregnant women on ANC follow-up at Nekemte Referral Hospital and Wollega University Hospital, Nekemte, Ethiopia, 2019

Table 5 Factors associated with poor sleep quality among pregnant women on ANC follow-up at Nekemte referral Hospital and Wollega University Hospital (Bivariate and Multivariate logistic analysis) ($n=408$), Nekemte, Ethiopia, 2019($n=408$)

Variables	Sleep quality		COR,95%CI AOR,95%CI *P*-value
	Poor Frequency (%)	Good Frequency (%)	
Age	78(32.4)	60(35.9)	1.00
18–23	122(50.6)	90(53.9)	1.04,(0.67,1.6) 1.52,(0.80,2.88) 0.194
24–29	41(17)	17(10.2)	1.85,(0.96,3.58) 2.17,(0.84,5.59) 0.106
≥ 30			
Occupation	104(43.2)	86(51.5)	1.00
House wife	74(30.7)	46(27.5)	1.33,(0.83,2.12) 1.39,(0.78,2.47) 0.262
Private worker	33(13.7)	22(13.2)	1.24,(0.67,2.28) 1.74,(0.83,3.64) 0.140
Employed	30(12.4)	13(7.8)	1.9,(0.93,3.88) 0.80,(0.30,2.12) 0.665
Daily labor			
Pregnancy intention	210(87.1)	161(96.4)	1.00
Planned	31(12.9)	6(3.6)	3.96(1.61,9.72) 4.25,(1.47,12.23)** 0.007
Unplanned			
Trimesters	22(9.1)	57(34.1)	1.00
1st trimester	109(45.2)	87(52.1)	3.24(1.91,6.03) 2.07,(1.41,6.09)* 0.028
2nd trimester	110(45.6)	23(13.8)	12.39(6.36,24.1) 5.84,(2.49,13.21)** 0.000
3rd trimester			
Gravida	107(44.4)	64(38.3)	1.28(0.85,1.92) 2.01(1.07,3.74)* 0.028
One	134(55.6)	103(61.7)	1.00
≥ 2			
Anxiety	133(55.2)	154(92.2)	1.00
(NO)	108(44.8)	13(7.8)	9.61(5.17,17.88) 6.62(2.61,16.82)** 0.000
(YES)			
Depression	131(54.4)	152(91)	1.00
(NO)	110(45.6)	15(9)	8.5(4.72, 15.31) 5.73(2.49,13.21)** 0.000
(YES)			
Stress	142(58.9)	130(77.8)	1.00
(NO)	99(41.1)	37(22.2)	2.45(1.56,3.82) 0.58(0.26,1.32) 0.199
(YES)			
sleep hygiene	123(50)	148(88.6)	1.00
(Good)	118(49)	19(11.4)	7.47(4.35,12.82) 2.93(1.41,6.09)** 0.004
(Poor)			
Social support	103(42.7)	57(34.1)	1.87(1.14,3.05) 1.08(0.57,2.07) 0.798
Poor	82(34)	52(31.1)	1.63(0.98,2.7) 1.10(0.59,2.06) 0.748
Medium	56(23.2)	58(34.7)	1.00
Strong			

NB: 1.00 references * *p*- value < 0.05 ** *p*- value < 0.01

[AOR = 5.84, 95%CI: (2.49, 13.21)] and [AOR = 2.07, 95%CI: (1.41,6.09)] respectively. This finding is supported by studies done in Turkey (Abiola et al. 2013) and China (Kloss et al. 2015). The possible reasons could be hormonal changes like increased secretion of estrogen and progesterone hormones and physiological changes such as increased tender breasts. The other reason could be a problem with respiration and the gastrointestinal system as a result of the pressure from the growing fetus on the thorax and abdomen as gestation advances (Kloss et al. 2015).

The likelihood of developing poor sleep quality among primigravida was two times higher than that of multigravida [AOR = 2.01, 95%CI:(1.07, 3.74)]. This result is supported by a study conducted in the USA (Ko et al. 2010). The possible justification for this association could be the fact that stress and work are involved with the challenges of maternal role acquisition that primigravida face with their first pregnancy and birth of the child.

In the current study, women with unplanned pregnancies were 4.25 times more likely to experience poor sleep quality compared with their counterparts [AOR = 4.25, 95%CI:(1.47, 12.23)]. Even though there is no relevant literature regarding this, it might be explained as inadequate preparation for pregnancy, childbirth, and nursing leading mothers to feel less or no ability to cope with all the changes and challenges that the birth of a baby brings to them.

In the present study, the prevalence of poor sleep quality among depressed pregnant women was 5.73 times higher compared to non-depressed pregnant women [AOR = 5.73, 95%CI:(2.49, 13.21)]. This result is supported by research conducted in China (Kloss et al. 2015) and Iran (LeBourgeois et al. 2005). The possible reason for this consistency could be the relationship between depression and sleep quality in pregnant women, showing that mood or emotional disturbances in depressed patients affect the quantity and quality of sleep, as depression is one of the main psychological factors leading to sleep disturbance (Kloss et al. 2015).

In the current study, the prevalence of poor sleep quality among participants with anxiety was 6.62 times higher compared to those who had no anxiety [AOR = 6.62, 95%CI: (2.61, 16.82)]. This result is supported by a study conducted in Iran (LeBourgeois et al. 2005). The possible reason might be due to emotional and physiological arousal caused by anxiety and worries, which would result in more attention to environmental and personal stimuli and lead to sleep disturbance.

The odds of having poor sleep quality among participants with poor sleep hygiene was nearly three times higher compared to those with good sleep hygiene [AOR = 2.93, 95%CI: (1.41, 6.09)]. This finding is in agreement with a study done in Vietnam (Chung et al. 2014). The possible justification for this might be drinking coffee in the evening, which affects melatonin hormone production that regulates sleep rhythms. Other reasons might be improper sleep hygiene behaviors like performing dynamic physical activity, flexible bedtime, going to bed without sleep sensation, and highly demanding activities before bedtime (like watching exciting movies) that disturb sleep patterns and lead to poor sleep quality (Lee et al. 2000).

In our study evaluating sleep quality and related factors in pregnant women, we found that sleep quality is poor for the majority of pregnant women and it is adversely affected by depression, anxiety, poor sleep hygiene, first-time pregnancy, unplanned pregnancy, and late gestational age.

Conclusion

The present study shows that the prevalence of poor sleep quality among pregnant women was high. Factors like depression, anxiety, poor sleep hygiene, first time pregnancy, unplanned pregnancy, and late gestational age were found to be associated with poor sleep quality.It is better to give attention to routine screening of sleep patterns in pregnant women and to give special concern for pregnant women with the above-stated factors.

The strength of the study

The strong points of this study were the sampling method and the use of valid and reliable instruments that have been applied in various studies. And the other strength of this study was using face-to-face interview techniques, which helped to address those mothers who were unable to read and write.

Limitation

Because it is a cross-sectional study design, it did't allow establishing a cause-effect relationship between sleep quality and potential risk factors, so it is recommended that future studies be performed in longitudinal format. It was a subjective assessment of sleep quality and not an objective assessment, so some information required participants to recall, which could lead to recall bias. Another limitation of the present study was that birth outcome was not assessed, which enables a better understanding of the effect of poor sleep quality on pregnancy.

Abbreviations

AMSH: Amanuel Mental Specialized Hospital; ANC: Antenatal Care Follow Up; DASS: Depression, Anxiety and Stress Scale; EPI-data: Epidemiological data; NRH: Nekemte Referral Hospital; OSS: Oslo social support; PI: Principal Investigator; PSQI: Pittsburgh Sleep Quality Index; SHI: Sleep Hygiene Index; SPSS: Statistical Package for Social Sciences; SV: Supervisor; US: United State; WHO: World Health Organization; WUH: Wollega University Hospital.

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Authors' contributions
JT participated in the conception, design of the study, reviewing the proposal, and data analysis. TA, HU, and AA participated in reviewing the proposal and writing the thesis. JT, MG prepared the manuscript for publication. TA has participated in supervising and writing manuscripts. All authors read and approved the final manuscript.

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Availability of data and materials
All data used to support the findings of this study are included within the manuscript and supporting information.

Declarations

Ethics approval and consent to participate
Ethical approval was obtained from the joint ethical review committee of University of Gondar and Amanuel Mental Specialized Hospital (Ref. No. Am/146/4/115) by Dr. Kibrom Haile, Tolesa Fanta, and Habtamu Derejew. The data collectors clearly explained the aims of the study to the study participants. Data was collected after obtaining verbal or written consent from each participant. The right was given to the study participants to refuse or discontinue participation at any time they wanted, and the chance to ask anything about the study. For the purpose of anonymity, the participant's name was not used at the time of data collection, and all other personnel information was kept entirely anonymously and confidentiality was assured throughout the study period.

Consent for publication
Not applicable.

Competing interests
The author declares no competing interests.

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