Original Article

The Prevalence, Pattern, and Predictors of Sleep Disorders Among Pregnant Women Attending Antenatal Clinic in a Southern Nigerian City

Udeme E. Asibong[1], Ubong Bassey Akpan[2], Okafor Chidi[3], Emmanuel Ekpenyong[4], Inyang Asibong[5], Saturday Etuk[2]

[1]Department of Family Medicine, University of Calabar Teaching Hospital, Calabar, Nigeria, [2]Department of Obstetrics and Gynecology, University of Calabar Teaching Hospital, Calabar, Nigeria, [3]Federal Psychiatric Hospital Calabar, Calabar, Nigeria, [4]Michael Okpara University of Agriculture, Umudike, Nigeria, [5]Department of Community Medicine, University of Calabar Teaching Hospital, Calabar, Nigeria

Abstract

Background: Sleep disorders are a common and often undiagnosed chronic health problem associated with an increased incidence of metabolic syndrome and pregnancy complications. **Aim:** The purpose of this study was to find out how common sleep disturbances are among pregnant women in Calabar, as well as their patterns and risk factors. **Materials and Methods:** A cross-sectional study was conducted among 360 antenatal attendees in the three major public health facilities in Calabar and 338 completed questionnaires were included in the analysis. Socio-demographic, medical, and obstetrics information were obtained using interviewer-administered questionnaires. Major international sleep classification tools were used to identify the patterns of sleep disturbance. Their weights and heights as well as their blood pressures (BPs) were measured. Data were analyzed using SPSS version 23. The predicting factors were extracted using a logistic regression model. **Results:** The prevalence of sleep disorder was 44.1%. The most common pattern of sleep disorder was insomnia (34.6%). Nineteen (5.6%) of them reported mixed disorders. On logistic analysis, pregnant women with normal BP (odds ratio [OR]: 0.440, 95% confidence interval [CI]: 0.230–0.843, P = 0.013), normal body mass index (OR: 0.365, 95% CI: 0.133–1.001, P = 0.050) and maternal age 20–30 years, (OR: 0.169, 95% CI: 0.30–0.969, P = 0.046) were significantly less likely to suffer from sleep disorders. Residing in a single a room apartment with family members was an independent social determinant of sleep deprivation (OR: 2.009, 95% CI: 1.003–4.025, P = 0.049). **Conclusion:** The study suggested that the prevalence of sleep disturbance is high among pregnant women. Counseling on good quality sleep during pregnancy may improve pregnancy outcome by ensuring appropriate weight gain and good BP control.

Keywords: Hypertension, Insomnia, maternal obesity, sleep quality scale

Introduction

Sleep is an essential part of human life because it allows the brain and other vital organs to function properly. Almost all aspects of reproduction, including puberty, pregnancy, and childbirth, are dependent on the hypothalamus, the part of the brain that houses the sleep center.[1,2] Sleep is a hyper-anabolic state, helps in repairs and detoxification of the body cells.[2,3]

Sleep is defined as the natural cyclical state of the mind and body with the eyes closed and is characterized by a partial or complete loss of consciousness.[1] As a result, the rising prevalence of sleep deprivation around the world is a public health concern.[3,4] Sleep deprivation triggers many chronic diseases including cardiovascular injuries, cancers, obesity, diabetes mellitus, sickle cell crisis, and preventable deaths.[4,5] The hormonal, physiological, anatomical, and psychological changes in women during pregnancy have been implicated in the increased incidence of sleep deprivation as they affect the quality and duration of sleep.[5]

The common patterns of sleep disorder in pregnancy include insomnia (shortened nighttime sleep duration <8 h),

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Address for correspondence: Ubong Bassey Akpan, Department of Obstetrics and Gynecology, University of Calabar, Calabar. E-mail: Ubongabasiakpan@gmail.com

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obstructive sleep apnea (OSA), restless leg syndrome, and narcolepsy (excessive daytime sleepiness).[6-8] Insomnia may be due to anxiety about the pregnancy and its possible outcome, the need to adopt certain sleeping postures and adjustments in the frequency of micturition while OSA may be worsened by the anatomical changes in the upper airways leading to bronchial edema, increased mucous secretion and nasal congestion.[9-11] It is a cause of sudden unexpected death.[11]

Restless leg syndrome is characterized by the tingling or itching feeling in the legs with an irresistible desire to move the limbs.[9] It is linked to neurological changes associated with the effects of hormones in pregnancy (progesterone and prolactin) on dopamine pathway/metabolism.[9,10] Narcolepsy, characterized by daytime sleepiness, has been linked to genetic and environmental factors.[12] Deficiency of folic acid, probably due to increased demand in pregnancy, has been implicated.[13]

The prevalence of sleep disorder in pregnancy varies from region to region and may depend on socio-cultural, medical, obstetric, and environmental factors.[14] Similarly, the pattern of the disorder also depends on environmental and socio-demographic factors that may need to be studied for proper understanding and case management. Sleep disorder is associated with negative pregnancy outcome. In the antenatal period, it is linked to increased incidences of gestational diabetes, hypertension, and preeclampsia as well as abnormal maternal weight gain.[15,16] In the intrapartum period, difficult labor, induction of labor, prolonged labor, and cesarean section rates have been found to be positively associated with sleep deprivation during pregnancy.[17,18] The perinatal complications that are attributable to sleep disorder include low birth weight and birth asphyxia.[18]

As there is increase in incidence of metabolic syndrome due to advanced maternal age and obesity and the associated obstetric complications globally,[19,20] it is important to describe how these factors (obesity and hypertension) influence the various pattern of sleep disorders among our pregnant women. The aim of this analysis was thus to assess the prevalence and kinds of sleep deprivation among our pregnant women as well as determine the major predictors. The findings from this study may proffer suggestions for appropriate intervention during the antenatal period on the management of sleep disorders and subsequently improve maternal and perinatal outcomes.

Materials and Methods

Study design and setting

This was a cross-sectional study conducted among pregnant women in Calabar, the capital of Cross River State of Nigeria. It was a multicenter study involving the three major health facilities in the city, namely, The University of Calabar Teaching Hospital, the Nigerian Navy Reference Hospital, Calabar (a military tertiary health facility), and the General Hospital (secondary health facility), Calabar from August 1, 2019, to January 31, 2020. These facilities offer maternal and newborn care to about three thousand pregnant women and their babies annually. The two tertiary hospitals also receive referrals from the neighboring cities and states in the south-south and southeast zones of Nigeria.

Instrument for data collection

Self-administered questionnaires were used to obtain data. The questionnaire consisted of two sections. The first section obtained data on the socio-demographic profile, medical, drug, and obstetric information. The second section examined the various patterns of sleep disorders among the women. This section was adapted from various international sleep quality scales namely the Berlin Questionnaire Sleep Evaluation, Pittsburgh sleep quality index, and Epiworth sleepiness scale. Using the information extracted, those with sleep disturbance were classified into OSA, insomnia, restless leg syndrome, and narcolepsy.[9,19-22]

The Pittsburg sleep quality index categorized the quality of sleep into good or poor using Likert score of 0-3, where 3 indicates the worse score.[23] It is widely used to identify insomnias.[3,20] Epworth sleepiness scale (ESS) is used to evaluate for narcolepsy.[3,22] The ESS questionnaire enquires about different circumstances of falling asleep at daytime and subclassify using a scale of 0-3 in each of the events. It uses the sum of 8 items score 0–3. The higher the patient's ESS score the more likely they are to develop narcolepsy. OSA is diagnosed using the Berlin Questionnaire. The Berlin questionnaire consists of 3 categories associated with the risk of having sleep apnea. Patients are designated as high risk or low risk based on the overall score in the symptom categories.[3,10]

The sensitivities and specificities of the instruments used in this study namely: Berlin questionnaire, ESS and Pittsburgh sleep quality index have been shown to be comparable with those of polysomnography which is expensive and not readily available.[24]

Test-re-test (intra-observer) reliability test was carried out to ensure that the instrument (questionnaire) could measure what it intended for. This was done among 20 pregnant women getting antenatal care in Calabar Women and Children Hospital. The questionnaires were distributed by two trained nurses who served as research assistants.

To assess the medical factors, especially hypertension and obesity among the women, the blood pressures (BPs) were measured using the mercury sphygmomanometer while the weight and height were measured and recorded. The BP and weight measurement were performed by the attending nurses who were also educated about the research and functioned as research assistants. At least five nurses were recruited as research assistants in each of the three health facilities. Routinely, the height of each pregnant woman is usually measured and recorded at the first antenatal visit while maternal BP, and weight are routinely checked during every visit.

The classification of hypertension was based on the American Cardiologist Association Definition.[25,26] Normal BP: Systolic BP (SBP) <120 mmHg and DBP <80 mmHg; elevated BP: SBP

120–129 mmHg and DBP <80 mmHg. Stage 1 hypertension; SBP 130-139 mmHg and DBP 80–89 mmHg. Stage 2 hypertension: SBP ≥140 mmHg or DBP ≥90 mmHg. Their body mass index (BMI) was calculated by dividing the weight in kilogram by the square of the height in meters (kg/m^2). They were classified using WHO criteria into normal, overweight, or obese.[27] Normal BMI 18.5–24.9; overweight 25.0-–29.9; class 1 obesity 30.0–34.9; class 2 obesity 35.0–39.9; class 3 obesity ≥40 kg/m^2.

Sample size determination

In a recent study in the USA, the prevalence of sleep disorder was reported at 30% among the general population. The sample size was thus calculated using Leslie and Kish single proportion formula.

$n = Z^2 Pq/d^2$ - Where n = Sample size.

Z = Standard normal deviate at 95% Confidence interval (CI) = 1.96

P = Prevalence of the condition from a previous study = 30%[28]

q = Probability of absence of the condition (1-P = 1-0.3 = 0.7)

d = Precision = 0.05

The calculated sample size was 322.7. It was raised to 360 to allow for non-response rate.

Recruitment of participants

A systematic random sampling method was adopted to recruit willing participants. The study enrolled women in their second trimester who met the inclusion criteria.

Inclusion criteria

1. Consenting parturient within the age of 15–49 years
2. Singleton pregnancy.

Exclusion criteria

1. Acutely ill patients
2. Women with Cognitive dysfunction, Caffeine addiction, or women on Benzodiazepines such as Nitrozapam and Neuroleptics.

Ethical issues

Approval was obtained from the Cross River State Ministry of Health Research Ethics Committee (*Rec No. CRSMOH/RP/REC/2019*/180). Each participant signed a written informed consent form. Participation was entirely voluntary. Confidentiality was ensured.

Results

Descriptive statistics

The final analysis included 338 completed questionnaires. The response rate was 93.9%. The mean age of the women was 29.65 ± 4.9 years and almost all except 11 (2.5%) possessed at least secondary level of education. One hundred and one (29.9%) were primigravidae. Table 1 shows the socio-demographic details.

A little <1/3 of them 102 (30.2%) reported previous pregnancy complication of which a significant proportion, 88 (26%), occurred in the first half of pregnancy resulting in miscarriages. These previous obstetric events were categorized depending on the gestational age of occurrence into previable (before 24 weeks), antepartum, intrapartum, and post-partum. More than half (55%) of them were obese (BMI ≥30 kg/m^2) while 16.3% had hypertension using the American Cardiologist Association classification[26] [Table 2].

The prevalence of sleep disorder in this study was 44.1%. The most common pattern of sleep disorder was insomnia (34.6%). Nineteen (5.6%) of the participants reported mixed disorders of which a combination of restless legs syndrome (RLS) and insomnia was experienced by ten (2.96%) women. Five women (1.3%) experienced symptoms of OSA and narcolepsy while the remaining four (1.18%) reported insomnia and OSA [Figure 1].

Inquiries were made about their current medications. A good proportion, 294 (87%), were on routine hematinics (iron and folic acid), 13 (3.9%) were taking anti-hypertensive drugs, 9 (2.7%) were on antiretroviral drugs and 4 (1.2%) on hypoglycemic agents. Those on Benzodiazepines were excluded for obvious reasons. 6 (1.8%) of them had been admitted for bed rest and in-patient care during the current pregnancy mostly for BP control.

Predictors of sleep disorders in pregnancy

On logistic analysis, pregnant women with normal BP (odds ratio [OR]: 0.440, 95% CI: 0.230–0.843, *P* = 0.013), normal BMI (OR: 0.365, 95% CI: 0.133–1.001, *P* = 0.050) and maternal age 20–30 years, (OR: 0.169, 95% CI: 0.30–0.969, *P* = 0.046) were significantly less likely to suffer from sleep disorders. In considering social factors such as nature of residential apartment, occupation, education, presence of house helpers, and family size, the study shows that among these factors, residing in a single room apartment with family members were significant predictors of sleep deprivation (OR: 2.009, 95% CI: 1.003–4.025, *P* = 0.049) [Table 3].

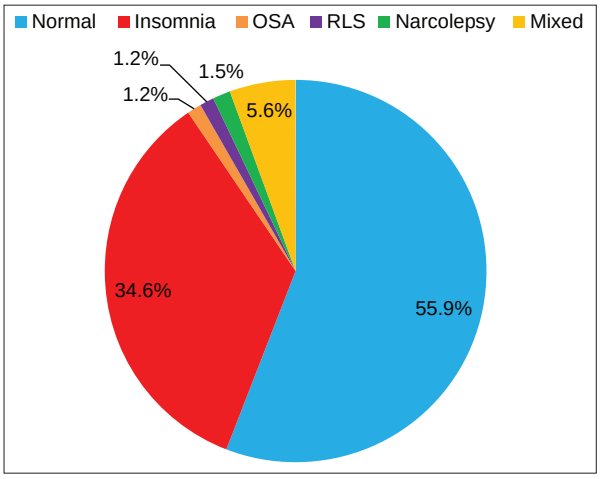

Figure 1: Patterns of sleep disorder

Table 1: Demographic profile

Variables	Frequency (n=338), n (%)
Age	
<20	10 (2.96)
20-29	141 (41.72)
30-39	181 (53.55)
>40	6 (1.77)
Total	338 (100)
Marital status	
Married	324 (95.90)
Single	14 (4.10)
Divorced/separated	0
Occupation	
Unemployed	87 (25.80)
Artisans	18 (5.30)
Business/trading	97 (28.70)
Professional	136 (40.20)
Level of education	
Uneducated	6 (1.80)
Vocational education	0
Primary education	5 (1.50)
Secondary	92 (27.20)
Tertiary	235 (69.50)
Nature of accommodation	
Single apartment	52 (15.40)
Self-contained	57 (10.90)
Flat	249 (73.70)
Duplex	0
Domestic help	
Self	55 (16.30)
House helper	23 (6.80)
Partner	159 (47.00)
Relative	97 (28.70)
Others	4 (1.20)

Table 2: Medical and obstetric profile

Variables	Frequency (n=338), n (%)
Parity	
Primigravidae	101 (29.9)
Para I	93 (27.5)
Para 2 and above	144 (42.6)
Previous pregnancy complications	
None	236 (69.8)
Miscarriage/previable	88 (26.0)
Antepartum	10 (3.0)
Intra-partum/postpartum	4 (1.2)
Maternal BMI	
Underweight	None (0)
Normal	27 (8.0)
Overweight	125 (37.0)
Obesity	186 (55.0)
BP	
Normal	154 (45.5)
Prehypertension	129 (38.2)
Hypertension	55 (16.3)

BMI: Body mass index, BP: Blood pressure

In considering the effect of the social environment like nature of residential apartment on sleep pattern, the study shows that residing in a single-room apartment had a significant positive effect to sleep disorder in pregnant women (P = 0.049), with a slight positive coefficient.

Other social factors such as level of education, marital status, having a domestic assistance during pregnancy, occupation, family size, and parity did not have any notable effect on sleep during pregnancy (P > 0.05).

Discussion

The prevalence of sleep disorder is higher among pregnant women compared to the general population.[29] This is evidenced in this study which shows a high sleep disorder prevalence of 44.1% among the antenatal women. This is higher than the prevalence of 35.5% reported among pregnant women in Western Nigerian.[12] When compared with the prevalence of 27% in the general population,[20] it is clear that pregnancy impacts negatively on normal sleep pattern.

Insomnia was the highest reported pattern of sleep disorders. Similar findings were reported in other studies[2,10-12,30] The high incidence of insomnia in pregnancy has been attributed to several factors. First, pregnant women tend to experience increased frequency of nocturnal micturition.[9] The enlarging gravid uterus compresses on the urinary bladder in the pelvis leading to decreased bladder filling capacity and inability to store large amount of urine. This frequent bladder emptying in the night then affects sleep duration and quality.

Second, in the third trimester of gestation women are usually advised to sleep in the left lateral position to prevent supine hypotension syndrome that may reduce cardiac output and compromise oxygen delivery to the fetus and the mother due to compression of the abdominal aorta. A significant number of women complained that this affects their quality of sleep as their partners have to turn them to adopt an appropriate position. The use of modified pillows in pregnancy has been suggested to ensure a woman maintains the required position during sleep.[29]

Although apart from insomnia, the incidences of other forms of sleep disorders were low, the findings from the study suggest that women with OSA and RLS are also at risk of having insomnia. A similar pattern had been documented in other studies.[3,4,6] Restless Leg Syndrome can lead to insomnia in women as this often results in difficulty in falling asleep, thus reducing the sleep duration. Similarly, women with OSA are also likely to suffer from insomnia due to poor sleep hygiene and external arousal for fear of hypoxia during sleep while daytime sleepiness is commonly associated with OSA in some individuals.[29] The incidence of RLS of 1.2% in our study was considered very low compared to high incidence from other studies.[6,11,14] This sleep disorder has been linked to folate and iron deficiency and its impact on the dopaminergic neuro-sensory pathway.[13,15] In our study 85%

Table 3: Logistic regression analysis showing predictors of sleep disorders among participants

Variables	*P*	OR	95% CI (lower bound-upper bound)
BMI			
Normal	0.050	0.365	0.133-1.001
Overweight/obesity	0.254	0.753	0.462-1.226
BP			
Normal	0.013	0.440	0.230-0.843
Prehypertension/hypertension	0.357	0.733	0.378-1.420
Previous sleep disorder			
No	0.526	0.648	0.169-2.481
Yes		1.000	
Family size/number of children			
Nulliparity	0.128	1.587	0.875-2.876
One	0.661	1.135	0.644-2.002
Two and above		1.000	
Accommodation			
Single apartment	0.049	2.009	1.003-4.025
Self-contained	0.839	0.921	0.418-2.032
Flat/duplex		1.000	
Domestic work assistant			
None	0.932	0.955	0.332-2.748
Partner	0.552	0.768	0.321-1.834
Relative	0.391	1.469	0.610-3.537
House maid		1.000	
Employment			
Unemployed	0.210	1.519	0.790-2.920
Artisans	0.979	0.985	0.305-3.183
Business/unemployed	0.997	1.001	0.552-1.815
Professional		1.000	
Education			
Informal		0.000	0.000-0.000
Primary	0.236	0.262	0.029-2.402
Secondary/tertiary	0.718	1.117	0.613-2.037
Age			
<20	0.093	0.131	0.012-1.405
20-29	0.046	0.169	0.030-0.969
30-39	0.035	0.162	0.030-0.880
40 and above		1.000	
Past obstetrics complications			
Yes	0.001	3.173	2.610-5.301
No	0.284	0.870	0.430-1.314

BMI: Body mass index, OR: Odds ratio, CI: Confidence interval, BP: Blood pressure, SBP: Systolic blood pressure

of the participants were taking routine folic acid and iron supplements prescribed in the antenatal clinics. This could have contributed to the low incidence of RLS among the pregnant women studied.

In assessing the predictors, of abnormal sleep pattern, the study shows that previous poor obstetric outcome and maternal BMI have been independent risk factors for sleep deprivation in pregnancy. Women with previous pregnancy loss/miscarriage had a significant higher incidence of insomnia ($P = 0.001$) when compared to other women. Anxiety concerning the possible recurrence of unpleasant events resulting bad obstetrics outcome in the index pregnancy must have been responsible for sleeplessness experienced by the affected women. A previous study has shown that previous obstetrics complication affects a woman's health later in life and subsequent pregnancies.[19]

Similarly, obese pregnant women were more likely to experience sleep deprivation compared with women of normal BMI. Similar findings were reported in other studies.[31-33] Leptin and Ghrelin are neurochemicals produced in adipose tissue and secreted during sleep. They help in fat metabolism and caloric regulation and their activities are enhanced by restorative sleep.[34] Leptin acts in the hypothalamus to reduce individual food consumption rates.[34] Sleep deprivation is therefore a risk factor for excessive weight gain. Pregnant women are encouraged to maintain appropriate weight.[34]

Furthermore, the study showed that women who experienced sleep disorder were susceptible to have hypertension. The link between sleep deprivation and elevated BP has been documented by several other studies.[35-37] Sleep disturbance has been linked to a high incidence of hypertension among women.[36] Sleep disruption due to RLS and OSA is associated with incidental hypertension while the link between insomnia and hypertension is attributed to the increased secretion of adrenaline due to activation of hypothalamic-pituitary-adrenergic pathway.[38] Elevated nighttime BP levels are linked to an increased risk of cardiovascular accidents.[34] Antenatal obstetric admissions for bed rest and medical sedation are cardinal protocols in the management of hypertensive diseases in pregnancy and have been shown to improve pregnancy outcome in high-risk patriuents.[5,11] Most sedatives are known to cause a drop in systolic BP.

In considering social factors, the study revealed that women who resided in single room apartment were more likely to suffer sleep disorders compared to the women who lived in flats and duplexes. Other social factors such as occupation, level of education did not significantly predict sleep deprivation. Similar findings were reported in other studies.[19,39,40]

Conclusion

The high prevalence of insomnia in pregnancy may be responsible for high incidences of obesity and hypertensive disorders among pregnant women. Sleep evaluation and counseling may improve pregnancy outcome especially in women of advanced age.

Limitation of the study

The study relies partly on the response from the participants. Some important medical information might not have been volunteered.

Data availability

The data can be obtained upon request.

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Conflicts of interest
There are no conflicts of interest.

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