

Epidemiological Study of Sleep Disorders, Onset Age of Gestational Sleep Disturbance and Associated Diseases in Pakistani Pregnant Females

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Abstract

Background: The aim of this research was to study the prevalence of insomnia and sleep apnea, gestational onset age of sleep disturbance in pregnancy, some clinical examinations and associated diseases in pregnant females in Pakistani pollution. A cross-sectional research approach was applied to conduct the study. Through a questionnaire data was collected from pregnant females from Punjab, Pakistan. Insomnia and sleep apnea were evaluated through symptoms mentioned in questionnaire. The blood samples were collected to blood tests for clinical examinations. Results of current study showed that insomnia was more common affecting 56.92% of pregnant women than sleep apnea (9.12%). Pregnant women who were overweight or obese were more likely to suffer from sleep disturbances than those who were underweight or a healthy weight. Furthermore, the third trimester of pregnancy (82.4%) had the highest prevalence of sleep

disturbances compared to the second (63.3%) and first trimester (56.6%) of pregnancy. There was a highly significant positive link between pregnancy and sleeplessness, anxiety, and stress throughout the first, second and third trimesters. In pregnant females the gestational onset age of sleep problems is 13.43th ±9.5 week of pregnancy. Pregnancy-related sleep disorders were more associated with migraines, headaches, iron deficiency, myopia, stomach problems, liver problems, and hypertension. Sleep issues increase as pregnancy progress. Pregnant females with sleep issues are at higher risk of other health issues.

Author Details

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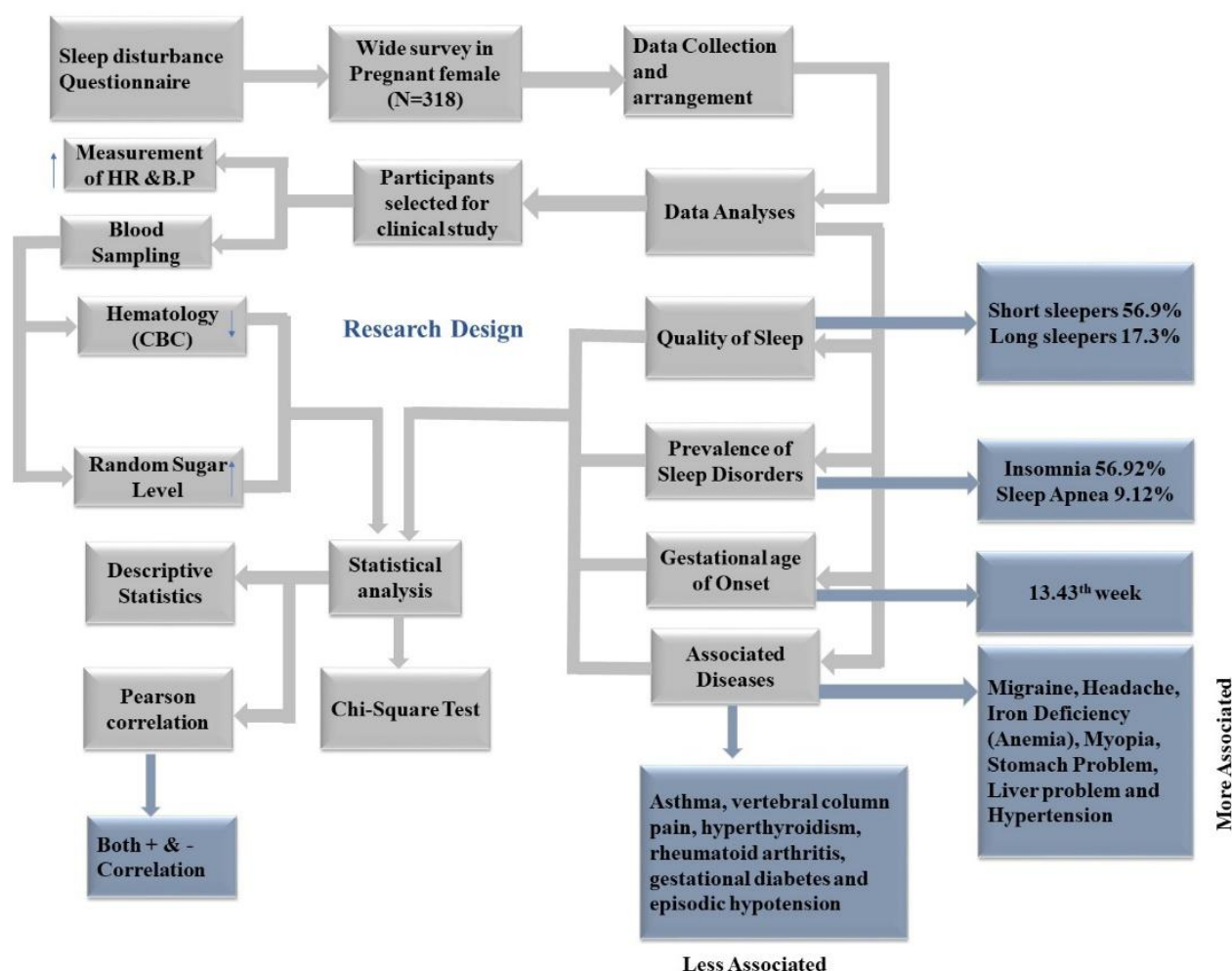
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Graphical abstract

Introduction

Sleep is an absolute physiological need for proper functioning of human body and serves as most important function human life. Sometimes a person may sleep for a shorter period of time than usual, and the primary reason for this might be a disruption in their typical sleep pattern. The disturbed sleep is a critical health issue of the current era throughout the world (Umar *et al.*, 2022). Pregnant women who get enough of rest help themselves by saving their energy for the labour and delivery process (Venugopal & Rajendran, 2018). The amount and quality of one's sleep may alter as one's pregnancy progresses. Total sleep time fluctuates throughout pregnancy, increasing in the first trimester, levelling off in the second trimester, and decreasing in the third trimester. As a pregnancy progresses, the frequency and length of awakenings increases (Ertmann *et al.*, 2020).

Both physiological and hormonal changes might disrupt sleep during pregnancy (Pires *et al.*, 2021). Possible causes include the emotional and psychological shifts that occur during pregnancy. Mechanical factors might contribute to issues including leg cramps, urine incontinence, shortness of breath, heartburn, and severe backaches (Jemere *et al.*, 2021). Because of a developing uterus, an active baby, and anxieties for the baby and themselves, some women may have trouble finding the ideal posture to sleep (Sut *et al.*, 2016). Both oestrogen and progesterone levels rise dramatically during pregnancy. Furthermore, research reveals that these hormones regulate not just reproduction but also a wide variety of other physiological and psychological processes, such as the quality of one's sleep, their mood, their senses, and their ability to learn and remember

(Deurveilher *et al.*, 2011). In late pregnancy, oestrogen levels are over 100 times higher and progesterone levels are up to 200 times higher than they were before conception. Increased upper airway resistance and breathing difficulties are brought on by oedema of the upper airway mucosa brought on by oestrogen. The hormone oxytocin, which causes uterine contractions, reaches its peak late at night, which may disrupt sleep in the third trimester (Deurveilher *et al.*, 2011; Oyiengo *et al.*, 2014).

Alterations in sleep quality are more common in the third trimester of pregnancy, with prevalence rates ranging from 40% to 96% depending on the population investigated and the period of measurement (Ko *et al.*, 2012; Ahmadi *et al.*, 2019). Multiple studies have demonstrated that sleep quality declines with increasing age, education, work, monthly income and using beverages (Sut *et al.*, 2016; Umar *et al.*, 2022). Fetal brain networks are very susceptible to maternal sleep loss, and poor sleep quality in the mother may lead to cognitive impairment. Children of such parents are at increased risk for developing anxiety and cognitive difficulties (Facco *et al.*, 2010). While researchers in affluent nations have studied the incidence and causes of poor sleep quality among expectant moms, the issue is little known in countries like Pakistan. Therefore, the purpose of this research is to study the sleep patterns, prevalence of insomnia and sleep apnea, gestational onset age of sleep disturbance in pregnancy, some clinical examinations and associated diseases in pregnant females in Pakistani population.

Material and Methods

Research design

Cross-sectional research design mixed with clinical investigation was applied in current study

Study population

The cross-sectional study was conducted on the Pregnant females in the province of Punjab, Pakistan.

Sample size

The study was conducted for unknown population size, so, the sample size was calculated through following formula.

$$\text{Sample size} = \frac{(Z - \text{score})^2 \times \text{Std Dev} \times (1 - \text{Std Dev})}{\text{Confidence Interval}^2}$$

Confidence level = 95%, Confidence interval = 0.055 and from Z-table Z-score =1.96

$$\text{Sample size} = \frac{(1.96)^2 \times 0.5 \times (1 - 0.5)}{(0.055)^2}$$

$$\text{Sample size} = 318$$

Data Collection

A Survey through a questionnaire (Supplementary file 1) was conducted for data collection. The researcher interviewed all of the pregnant females who took part in this cross-sectional research to have them fill out questionnaires and the data was collected in the form of responses. The participants were asked a variety of questions about their sleeping patterns, levels of physical activity, lifestyle choices, and mood swings, and their responses were recorded (Supplementary file 3).

Insomnia evaluation

Although insomnia is the most often reported health issue, it is often overlooked. The severity of insomnia was measured using the Insomnia index in modified version to

determine its frequency among the Pakistani pregnant females. The questions assess how severe sleep issues are, how well you're able to fall asleep and stay asleep, how satisfied you are with your sleep routine as it stands, how much it affects your ability to function throughout the day, and how noticeable your sleep problems are to others.

Sleep apnea evaluation

Sleep apnea was evaluated by detailed questionnaire method.

Clinical examinations

Following an analysis of sleeping habits and the identification of individuals suffering from sleep disorders, an investigation into the health issues that are often connected with insufficient sleep was carried out on the participants who were chosen. After collecting the blood samples, a series of blood tests and medical tests (including a complete blood count CBC, blood sugar level, blood pressure, and pulse per minute) were carried out in order to determine the conditions that are related with the sleep disturbance.

Statistical analysis

For the purpose of analyzing the data obtained from an intricate sample plan, the Minitab program, version 19.0, was used. Each estimate was given a different degree of importance depending on the demographic statistics collected from the region under consideration. All of the individuals who had interest variables that were accessible were included in the analysis, however missing data were ignored. Distribution of sleep apnea and insomnia using the Rao Scott Chi-Square Test. When it came to the findings, a probability level of 0.05 or below was regarded as statistically significant.

Results

The purpose of this research is to study the sleep patters, prevalence of insomnia and sleep apnea, onset age of sleep disturbance in pregnancy and associated diseases in pregnant females in Pakistani pollution.

Demographic characters

In the following study 318 pregnant females were participated. The participants were further grouped according to residency (urban 55.6%; rural 44.4%), age groups (≤ 25 years 50%, > 25 years 50%), qualification (uneducated 18.8%; matriculation 38.4%; intermediate 19.5%; graduation 23.3%), occupation (house wife 83%; part time job 9.8%; full time job 7.2%), BMI (underweight 1.9%; healthy weight 57.2%; over weight 33%; obesity 7.9%) and three phases of pregnancy (first trimester 35.5%; second trimester 37.8%; third trimester 26.7%) (Table 1).

Table 1: Demographic characters of pregnant females

Demographic variable	Frequency	Percentage
Residency		
Urban	177	55.6 %
Rural	141	44.4 %
Age Groups		
≤ 25 years	159	50 %
> 25 years	159	50 %

Qualification		
Uneducated	60	18.8 %
Matriculation	122	38.4 %
Intermediate	62	19.5 %
Graduated	74	23.3 %
Occupation		
House wife	264	83 %
Part time job	31	9.8 %
Full time job	23	7.2 %
BMI		
Underweight (<18.5)	6	1.9 %
Healthy weight (18.5—24.9)	182	57.2 %
Over weight (25.0—29.9)	105	33 %
Obesity (>30)	25	7.89%
Stages of pregnancy		
First Trimester (0-14 weeks)	113	35.5 %
Second Trimester (15-28weeks)	120	37.8 %
Third Trimester (29-40 weeks)	85	26.7 %

Duration of sleeping hours (N=318)

Among all respondents 181 (56.9%) participants were not enjoying the amount of recommended sleep hours (7-8 hours/night), they were categorized as short sleepers (<7 hours/hours), 82 participants (25.8%) were enjoying recommended sleep during their pregnancy and 55 participants (17.3%) were categorized as long sleepers who were sleeping more 8 hours per night (Table 2).

Table 2: Sleep duration of participating pregnant females (N=318)

Demographic variable	Short sleepers (n=181)	Normative sleepers (n=82)	Long sleepers (n=55)	X ²	P- value
Residency					
Urban (n=177)	100 (56.5%)	46 (26%)	31 (17.5%)	0.03	0.985
Rural (n=141)	81(57.5%)	36 (25.5%)	24 (17%)		
Age Groups					
≤25 years (n=159)	59 (37.1%)	52 (32.7%)	33(20.8%)	27.45	0.001**

>25 years (n=159)	122 (76.7%)	30 (18.7%)	22(13.8)		
Qualification					
Uneducated (n=60)	24 (40%)	23 (38.3%)	13 (21.7%)		
Metric (n=122)	75 (61.5%)	26 (21.3%)	21 (17.2%)	10.30	0.113
Intermediate (n=62)	40 (64.5%)	13 (21%)	09 (14.5%)		
Graduated (n=74)	42 (56.8%)	20 (27%)	12 (16.2%)		
Occupation					
House wife (n=264)	141 (53.4%)	71 (26.9%)	52 (19.7%)		
Part time job (n=31)	25 (80.6%)	6 (19.4%)	0 (0%)	11.17	0.025*
Full time job (n=23)	15 (65.3%)	5 (21.7%)	3 (13%)		
BMI					
Underweight (n=6)	3 (50%)	0 (0%)	3 (50%)		
Healthy weight (n=182)	98 (53.8%)	48 (26.4%)	36 (19.8%)	12.56	0.05*
Over weight (n=105)	64 (61%)	25 (23.8%)	16 (15.2%)		
Obesity (n=25)	16 (64%)	9 (36%)	0 (0%)		
Stages of pregnancy					
First Trimester (n=113)	50 (44.3%)	26 (23%)	37 (32.7%)	51.37	0.001**
Second Trimester	64 (53.3%)	47 (39.2%)	9 (7.5%)		

(n=120)			
Third			
Trimester	67 (78.8%)	9 (10.6%)	9 (10.6%)
(n=85)			
Non steric = non-significant; * = Significant; ** = Highly significant			

Prevalence of Sleep disorders

The prevalence rate of insomnia and sleep apnea among pregnant females was measured among all demographic characters. 56.92% (n=181) pregnant females were suffered from insomnia while only 9.12% (n=29) were suffered from sleep apnea. The overall prevalence rate of both sleep disorders was 66.04 %(n=210/318) (Table 3).

Table 3: Prevalence of Sleep disorders during pregnancy

Demographic variable	Insomnia (n=181; 56.92%)	Sleep apnea (n=29; 9.12%)	Over all (n=210; 66.04%)	X ²	P- value
Residency					
Urban (n=177)	100 (56.5%)	22 (12.4%)	122 (68.9%)	4.36	0.037*
Rural (n=141)	81(57.4%)	7 (5.0%)	88 (62.4%)		
Age Groups					
≤25 years (n=159)	59 (37.1%)	6 (3.8%)	65 (40.2%)	1.66	0.198
>25 years (n=159)	122 (76.7%)	23 (14.5%)	145 (91.2%)		
Qualification					
Uneducated (n=60)	24 (40%)	8 (13.3%)	32 (53.3%)	20.06	0.001**
Metric (n=122)	75 (61.5%)	6 (4.9%)	81(66.4%)		
Intermediate (n=62)	40 (64.5%)	0 (0%)	40 (64.5%)		
Graduated (n=74)	42 (56.8%)	15 (20.3%)	57 (77%)		
Occupation					
House wife	141 (53.4%)	22 (8.3%)	163(61.7%)	12.78	0.002**

(n=264)					
Part time job (n=31)	25 (80.6%)	3 (9.7%)	28 (90.3%)		
Full time job (n=23)	15 (65.2%)	4 (17.4%)	19 (82.6%)		
BMI					
Underweight (n=6)	5 (83.3)	0 (0%)	5 (83.3%)		
Healthy weight (n=182)	96 (52.7%)	12 (6.6%)	110 (60.4%)	4.85	>0.05
Over weight (n=105)	64 (61%)	11 (10.5%)	75 (71.4%)		
Obesity (n=25)	16 (64%)	6 (24%)	22 (88%)		
Stages of pregnancy					
First Trimester (n=113)	50 (44.2%)	14 (12.4%)	64 (56.6%)		
Second Trimester (n=120)	64 (53.3%)	12 (10%)	76 (63.3%)	9.08	0.011*
Third Trimester (n=85)	67 (78.8%)	3 (3.5%)	70 (82.4%)		

Non steric = non-significant; * = Significant; ** = Highly significant

Prevalence of Tension and anxiety in pregnant females

The rate of pregnancy related anxiety was highest in first trimester (46.9%) than second trimester (42.5%) and third trimester (31.8%) but the rate of tension was secondly highest in third trimester (17.6%) after first trimester (24.8%) and followed by second trimester (15%) (Figure 1).

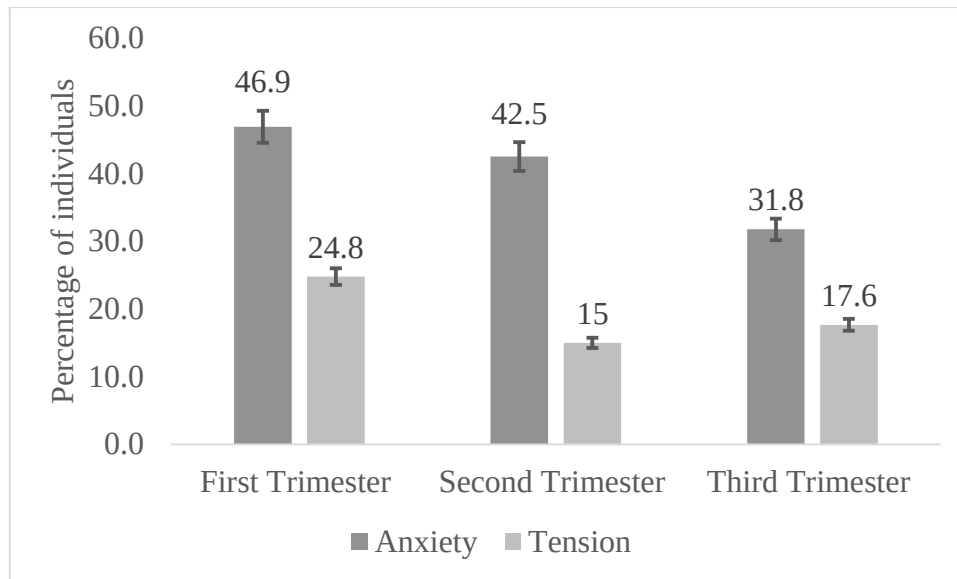


Figure 1: Prevalence of anxiety and tension among pregnant females

Correlation among phases of pregnancy, sleep disorders, anxiety and tension

Correlation analysis (Table 4) showed that first trimester and third trimesters of pregnancy had perfect positive correlation with insomnia, anxiety and tension while perfect negative correlation with sleep apnea in highly significant way ($p < 0.001$). But the second trimester had perfect positive correlation with sleep apnea and anxiety and perfect negative correlation with insomnia and tension significantly ($p < 0.001$).

Table 4: Correlation among phases of pregnancy, sleep disorders, anxiety and tension

Demographic variable	Sub-group (Age)	Insomnia (n=181; 56.9%)	Sleep apnea (n=29; 9.1%)	Anxiety (n=53; 16.7%)	Tension (n=28; 8.8%)
First Trimester (n=113)	≤25 years (n=62)	27 (43.6%)	3 (4.8%)	27 (43.6%)	21 (33.9%)
	>25 years (n=51)	23 (45.1%)	11 (21.6%)	26 (51%)	7 (13.7)
	Coefficient r	1	-1	1	1
	P value	**	**	**	**
Second Trimester (n=120)	≤25 years (n=61)	19 (31.1%)	9 (14.8%)	28 (45.9%)	4 (6.6%)
	>25 years (n=59)	45 (76.3%)	3 (5.1%)	23 (39%)	14 (23.7%)
	Coefficient r	-1	1	1	-1
	P value	**	**	**	**

Third Trimester (n=85)	≤25 years (n=36)	28 (77.8%)	3 (8.3%)	9 (25%)	3 (8.3%)
	>25 years (n=49)	39 (79.6%)	0 (0%)	18 (36.7%)	12 (24.5%)
	Coefficient r	1	-1	1	1
	P value	**	**	**	**

Correlation is significant at the 0.01 level (1-tailed). **, correlation lied between -1 (perfectly negative correlation) and +1 (perfectly positive correlation) and 0 showed no correlation. **Gestational age of onset of sleep disorders**

In addition, we examined the gestational age at which the patterns of sleep disturbances appeared in pregnant females. The gestational ages of those who participated in the survey varied from 1 week to 40 weeks. There was significant variation in the gestational age of sleep disturbance among the respondents. The average gestational age was 22.43±9.50 weeks. At various phases of their pregnancies, various individuals suffered from one or more types of sleep disorders. The following are the onset age patterns that can be determined from the regression equation (Figure 2a):

$$\text{Gestational age of onset} = -2.771 + 0.7226 (\text{Gestational age})$$

From this equation gestational age onset patterns for pregnant females were computed. The gestational onset of age was measured in pregnant females was 13.43th week.

Clinical examinations of pregnant females experiencing sleep disturbance (N=20)

Blood samples were collected from 20 participants who were suffering from sleep disturbance to check some clinical aspects. The mean haemoglobin level was reported as 10.05±1.6 g/dl which is lower than normal range (11.5-16 g/dl) in pregnant females. The blood pressure (systolic/Diastolic ratio) was reported higher (1.56±0.09) than normal range 1.5. Similarly, the heart rate (95.1±1.92 HR/Min) was reported higher than normal range (70-90 HR/Min) and higher blood sugar level (96.9±6.96 mg/dl) as compared to upper normal limit (≤95 mg/dl) (Table 5).

Table 5: Clinical examinations of pregnant females experiencing sleep disturbance (N=20)

Variable	Mminimum-Mmaximum	Mean± std	Normal value
Haemoglobin level (g/dl)	7-14.8	10.05±1.6	11.5-16
B.P (systolic/Diastolic ratio)	1.4-1.7	1.56±0.09	1.5
Heart rate (HR/Min)	92-100	95.1±1.92	70-90
Sugar (mg/dl) (Before meal)	83-111	96.9±6.96	≤95

Correlation among haemoglobin, Heart rate, systolic/Diastolic ratio, sugar level, Anxiety, tension and sleep disturbance during pregnancy

Pregnancy related sleep disturbance (insomnia or sleep apnea) was perfectly positively correlated with Haemoglobin level, blood pressure and Sugar level before in significant way (p <0.001) while perfectly negatively correlated with heart rate in significant way (p <0.001). The pattern of correlation of pregnancy related anxiety

and tension was different. The anxiety was perfectly positive correlated with heart rate and sugar level (before meal) but perfectly negatively correlated with haemoglobin level and blood pressure ($p < 0.001$). The tension was only perfectly positively correlated with heart rate in significant way ($p < 0.001$) and perfectly negatively correlated with haemoglobin level, blood pressure and sugar level (before meal) in significant manner ($p < 0.001$) (Table 6).

Table 6: Correlation among haemoglobin, Heart rate, systolic/Diastolic ratio, sugar level, Anxiety, tension and sleep disturbance during pregnancy

Demographic variable	Sub-group (Age)	Haemoglobin level (g/dl)	B.P (systolic/Diastolic ratio)	Heart rate (HR/Min)	Sugar (mg/dl) (Before meal)
Sleep disturbance (N=20)	≤25 years (n=11)	10.35±1.82	1.58±0.08	95.09±2.0 7	98.09±7.0 5
	>25 years (n=9)	9.54±1.23	1.55±0.09	95.45±2.3 8	97.09±7.0 5
	Coefficient r	1	1	-1	1
	P value	**	**	**	**
Anxiety (N=131)	≤25 years (n=64)	10.35±1.82	1.58±0.08	95.09±2.0 7	98.09±7.0 5
	>25 years (n=67)	9.54±1.23	1.55±0.09	95.45±2.3 8	97.09±7.0 5
	Coefficient r	-1	-1	1	1
	P value	**	**	**	**
Tension (61)	≤25 years (n=28)	10.35±1.82	1.58±0.08	95.09±2.0 7	98.09±7.0 5
	>25 years (n=33)	9.54±1.23	1.55±0.09	95.45±2.3 8	97.09±7.0 5
	Coefficient r	-1	-1	1	-1
	P value	**	**	**	**

Correlation is significant at the 0.01 level (1-tailed). **, correlation lied between -1 (perfectly negative correlation) and +1 (perfectly positive correlation) and 0 showed no correlation.

Associated diseases

Migraine, Headache, Iron Deficiency (Anemia), Myopia, Stomach Problem, Liver problem and Hypertension were more associated with pregnancy related sleep disorders while asthma, vertebral column pain, hyperthyroidism, rheumatoid arthritis, gestational diabetes and episodic hypotension were less associated with pregnancy related sleep disorders (Figure 2b).

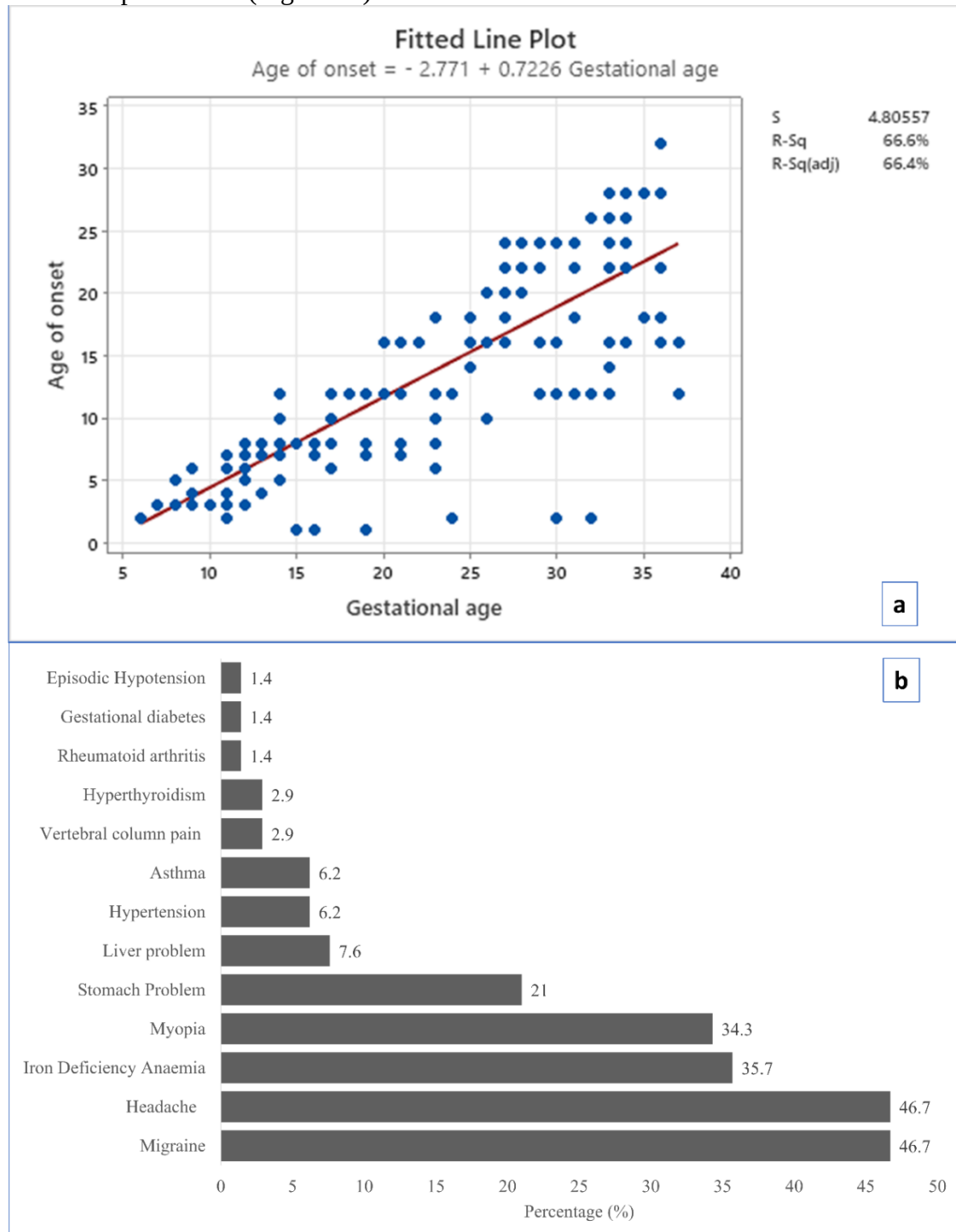


Figure 2: (a) Gestational age of onset of sleep disorders (b) Associated diseases with pregnancy related sleep disorders

Discussion

The human body cannot function properly without adequate sleep. Sleep disruption has emerged as a major public health concern in the modern period throughout the

world (Umar *et al.*, 2022). According to Venugopal and Rajendran (2018), pregnant women who obtain an adequate amount of rest aid themselves by conserving their energy for the process of labouring and delivering their babies. As a pregnancy continues, the quantity and the quality of sleep might be affected. The total amount of time spent sleeping shifts three times throughout a normal pregnancy: it grows longer during the first trimester, stays about the same during the second trimester, and then gets shorter during the third trimester. According Ertmann *et al.* (2020), as a pregnancy continues, women experience longer and more frequent awakenings. Researchers in developed countries have analysed the prevalence and reasons of sleeplessness during pregnancy, but the problem is poorly understood in less developed nations like Pakistan. This study aims to examine the sleep patterns, prevalence of insomnia and sleep apnea, gestational beginning age of sleep disturbance in pregnancy, as well as the results of a number of clinical tests and the prevalence of a number of diseases among pregnant women in polluted areas of Pakistan, gestational onset age of sleep disturbance in pregnancy, some clinical examinations and associated diseases in pregnant females in Pakistani pollution.

Results of current study showed that 74.2% pregnant females had poor sleep quality and quantity. Furthermore, our results showed that the prevalence rate of insomnia and sleep apnea among pregnant females was measured among all demographic characters. 56.92% pregnant females were suffered from insomnia while only 9.12% were suffered from sleep apnea. Percentage of poor sleepers in this study is higher than the results of a study conducted by Du *et al.* (2021) in Tongzhou District of Beijing, China. They reported that 34.14% women were poor sleepers.

In addition, our results showed that the prevalence of sleep disorders in three phases of pregnancy was highest in third trimester (82.4%) than second trimester (63.3%) and first trimester (56.6%) respectively. Poor sleep quality is seen at varying rates during the three trimesters, according to previous research. In 2014, a cross-sectional study conducted by Mindell *et al.* (2015) among 2427 pregnant women in the United States indicated that 76.3% of the women experienced poor sleep quality during pregnancy. The prevalence of poor sleep quality among American women was 48% in the second trimester and 40% in the third trimester (Bublitz *et al.*, 2018). A prospective observational study conducted in Taiwan by Tsai *et al.* (2016) indicated that the prevalence of poor sleep quality was 43.3%, 37.2%, and 50.6% during early, middle, and late pregnancy, respectively.

In current we wound that insomnia, anxiety, and stress were all found to have a perfect positive link with the first and third trimesters of pregnancy, whereas sleep apnea was found to have a perfect negative correlation. Second trimester sleep apnea was significantly positively correlated with anxiety, while second trimester insomnia and tension were inversely correlated. These results are supported by existing literature. According to Maghami *et al.* (2021), problems with sleep, depression, and overall mental health were connected with the first, second, and third trimesters of pregnancy. According to Juulia Paavonen *et al.* (2017), in the third trimester of pregnancy, the symptoms of insomnia were connected with the symptoms of depression in both the mothers and the fathers of the unborn child. According to the findings of a study that Tsai *et al.* (2016), carried out in Taiwan, clinical depression is linked to the third trimester of pregnancy.

In this study we measured the gestational onset of age of sleep disorders in pregnant females that was $13.43^{\text{th}} \pm 9.5$ week. With our best knowledge this is first study to measure gestational onset of age of sleep disorders in pregnant females. Furthermore, some clinical examinations were also done in this study. According to the findings, the mean haemoglobin level was lower in pregnant females than normal range. The blood pressure (systolic/Diastolic ratio) was reported higher than normal range,

Similarly, the heart rate was reported higher than normal range and higher blood sugar level was also reported as compared to upper normal limit. Ferguson *et al.* (2002) and Khoigani *et al.* (2012) both reported low level of haemoglobin among pregnant females. Ferguson *et al.* (2002) reported below 11 g/dl of haemoglobin in pregnant females. According to Garzon *et al.* (2020), iron deficiency is major reason of low haemoglobin in pregnant females. According to Umar *et al.* (2022) sleep disorders are associated with higher heart rate and blood sugar level.

In current study we found that migraine, Headache, Iron Deficiency (Anemia), Myopia, Stomach Problem, Liver problem and Hypertension were more associated with pregnancy related sleep disorders. These results are supported by literature. Umar *et al.* (2022), reported the association between sleep disorders and many health issues (migraine, headache, anxiety, obesity, myopia and hypertension), Garzon *et al.* (2020) reported iron deficiency among pregnant females.

Conclusion

The current study found that 66.04 % pregnant females were suffering from sleep disorder and insomnia is more prevalent than sleep apnea. The sleep disorders prevailed more in obese pregnant females followed by underweight, over weight and healthy weight respectively. Furthermore, the prevalence of sleep disorders in three phases of pregnancy was highest in third trimester (82.4%) than second trimester (63.3%) and first trimester (56.6%) respectively. First trimester and third trimesters of pregnancy had perfect positive correlation with insomnia, anxiety and tension while perfect negative correlation with sleep apnea in highly significant way. But the second trimester had perfect positive correlation with sleep apnea and anxiety and perfect negative correlation with insomnia and tension significantly. The gestational onset of age of sleep disorders in pregnant female is 13.43th week. Furthermore, migraine, Headache, Iron Deficiency (Anemia), Myopia, Stomach Problem, Liver problem and Hypertension were more associated with pregnancy related sleep disorders while asthma, vertebral column pain, hyperthyroidism, rheumatoid arthritis, gestational diabetes and episodic hypotension were less associated with pregnancy related sleep disorders.

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Ethical Approval

This study, titled "*Epidemiologic Studies of Sleep Disorders, Onset Age of Gestational Sleep Disturbance, and Associated Diseases in Pakistani Pregnant Females*," was reviewed and approved by the Ethical Committee of the University of Okara. The approval reference number is **UO/DOZ/2023/SD1**. The research adhered to the ethical principles outlined in the Declaration of Helsinki. Informed consent was obtained from all participants prior to their inclusion in the study. Participants were assured of their confidentiality and anonymity, and their right to withdraw from the study at any time without consequences.

Research involving Human Participants

Yes

Informed consent

Yes

Disclosure of potential conflicts of interest

The authors declare no conflict of interest.

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