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Sleep Quality and Parasomnia-Related Symptoms Among Pregnant Women in Gujranwala, Pakistan: A Cross-Sectional Study

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Abstract

Background

Sleep disturbances are common in pregnancy and are believed to be related to hormonal, physiological and psychological changes. Parasomnias are a group of poorly recognized sleep disorders. Poor sleep quality in pregnant women has been linked to adverse maternal outcomes such as hypertension and pre-eclampsia, yet data on parasomnia-related symptoms in Pakistani populations are scarce. This study assessed sleep quality among pregnant women in Gujranwala, Pakistan, with particular focus on parasomnia-related symptoms.

Methods

An analytical, observational cross-sectional study was conducted over six months among pregnant women attending prenatal clinics and maternity hospitals in Gujranwala. Using a non-probability convenience sampling technique, 278 pregnant women were approached, of whom 262 completed a paper-based Pittsburgh Sleep Quality Index (PSQI) questionnaire (94.2% response rate). Data were analyzed in IBM SPSS version 27.0 using descriptive statistics, the Shapiro-Wilk test for normality, frequency and percentage analysis, and Cramér's V to measure the strength of association between individual sleep disturbance items and overall sleep quality.

Results

The mean global PSQI score was 7.57 ± 4.27 (median, 6.00; range, 0–21). The PSQI scores were not normally distributed (Shapiro-Wilk W = 0.938, $p < 0.001$) therefore non-parametric analysis was justified. Based on the standard cutoff (PSQI > 5), 165 (63.0%) participants were poor sleepers, and 97 (37.0%) were good sleepers. Cramers V analysis indicated that most of the items on sleep disturbances were significantly related to overall sleep quality. The strongest association was found between difficulty in falling asleep and daytime dysfunction. Night-time bathroom trips, feeling too cold and other miscellaneous causes showed weak, non-significant associations.

Conclusions

Poor sleep quality was highly prevalent among pregnant women in Gujranwala, affecting nearly two-thirds of participants, a pattern consistent with findings from other regions of Pakistan and internationally. Specific, identifiable disturbances rather than uniform impairment drove most of this burden. These results support the routine screening for sleep problems during pregnancy and the early use of nonpharmacologic interventions, such as education regarding sleep hygiene and behavioral strategies, to protect maternal well-being during pregnancy.

Introduction

Physiology of Normal Sleep

Sleep is essential for hormonal, physiological, and mental well-being. A human being spends almost one-third of their life in sleep. Lack of proper sleep leads to hormonal fluctuations, mood swings, or impaired cognitive functions. There are 2 main neurobiological processes believed to be involved in the regulation of sleep and wakefulness: the circadian cycle and the homeostatic process. Sleep and wakefulness are regulated by an internal body clock called the circadian cycle that follows the light-dark cycle. In contrast, the homeostatic process arises from the need for sleep between waking periods. GABA (Gamma-aminobutyric acid) plays an important role as an inhibitory neurotransmitter of the CNS. It binds with the GABA-A receptor in the human brain, which in turn promotes sleep. Chemicals like acetylcholine, dopamine, norepinephrine, and serotonin work synergistically to regulate wakefulness. Figure 1 summarizes the physiology of normal sleep.(1, 2, 3)

Sleep Changes During Pregnancy

Sleep changes can alter several endocrine, metabolic, and cognitive functions, which are very important for the maintenance of pregnancy and also for the growth of the fetus. Some evidence points out that sleep disturbances like sleep apnea and duration of sleep are associated with severe outcomes for both mother and fetus. Almost 60% to 100% of pregnant women experience some architectural changes in sleep and its quality. (4)

Hormonal and Physiological Basis of Sleep Disturbances in Pregnancy

There are significant hormonal changes in pregnancy that play a major role in sleep disturbance. Hormones, especially estrogen and progesterone, are very high just before delivery, while prolactin and cortisol are also very high, especially in the third trimester. Many pregnant women feel sleepier during early pregnancy due to the calming effect of progesterone. On the other hand, estrogen brings more changes in REM sleep. Fluctuations in thyroid hormones, especially when levels are low, are responsible for daytime drowsiness. Some studies also suggest that poor sleep is not only associated with hormonal changes but also with physiological changes. Frequent urination at night, gastric discomfort like acid reflux, and musculoskeletal pain due to the growing fetus are also among the major physiological disturbances that cause sleep disturbance.(5, 6, 7)

Definitions of Parasomnias

Parasomnias are undesirable physical activities or experiences that take place when a person goes to sleep, during sleep, or between arousals from sleep. Additionally, parasomnias can also occur during non-rapid eye movement sleep (NREM), rapid eye movement sleep (REM), and during transitions to and from sleep. The term “parasomnia” was derived from two Greek words: ‘para’, meaning beside, and ‘somnus’, meaning sleep. Basically, parasomnias are a group of various sleep disorders. They are specifically characterized by unusual, displeasing motor, verbal, or behavioral events that take place during sleep or awakening.(8, 9)

Types of Parasomnias

In NREM-related parasomnias, there is incomplete awakening, insufficient response, very low cognition, and almost complete amnesia. Sleep paralysis, hypnagogic/hypnopompic hallucinations, and cataplexy (sudden or temporary loss of muscle tone) are the best explanatory clinical results of REM-related parasomnias. Some other forms of parasomnias have also been discussed in the literature, but they are not part of NREM- or REM-related parasomnias. Sleep enuresis is one of them.(10)

Epidemiology of Parasomnias in the General Population

Previous data show that parasomnias and sleep-related disorders are more common in adults, and 30% of adults have at least one type in their lifetime. A survey of 1000 adults showed a prevalence ranging from 4% to 67%, while sleep talking, nightmares, sleepwalking, and sleep terrors had a prevalence of 66.8%, 66.2%, 22.4%, and 10.4%, respectively. Low motivation is associated with these conditions, while gender has a very low level of correlation with these sleep-related conditions. Moreover, an individual's genetic makeup can also contribute to parasomnia and other sleep-related conditions. Importance of Parasomnias in Pregnancy The prevalence of subjective sleep disturbance, poor sleep quality, insufficient night-time sleep, daytime sleepiness and night-time awakenings in pregnant women has been reported to be as high as 76.3% with the prevalence increasing to 83.5% after 8 months of gestation. Some 38% of women reported at least one sleep complaint during their first 16 weeks of gestation, with waking up too early being the most common. By the 12th week of gestation, sleep duration increases; however, sleep quality deteriorates compared to the first trimester. Figure 2 shows the summary of epidemiological data of parasomnias.(11, 12, 13)

Role of Healthcare Professionals

Pregnant women who have difficulty sleeping have a greater chance of developing hypertension and pre-eclampsia. At present, non-pharmacological treatments such as relaxation and proper sleep hygiene are used to improve sleep quality, specifically in pregnant women, because these methods carry fewer probable side effects and lead to increased satisfaction. Because of the close relationship with mental and physical health, there is a greater chance of a direct effect on the health of the fetus, which is why various researchers have recommended non-pharmacological treatments and methods that are effective for both the physical and mental health of pregnant women. Sleep health education also improves the quality of sleep among pregnant women.(14)

Rationale of This Study

Sleep disturbances are commonly experienced during pregnancy due to hormonal, physiological, and psychological changes. Among these disturbances, parasomnias represent an important but often overlooked group of sleep disorders that may negatively affect maternal well-being and fetal health. These disturbances can lead to poor sleep quality, daytime fatigue, and may contribute to adverse pregnancy outcomes.

Although previous studies have highlighted the association between sleep disturbances and unfavorable maternal and fetal outcomes, parasomnias during pregnancy remain under-recognized and insufficiently studied, particularly in developing countries. In Pakistan, there is limited data available regarding the frequency of parasomnias and their relationship with sleep quality and associated risk factors among pregnant women.

The lack of local evidence may result in inadequate recognition and management of sleep-related problems in this population.

Furthermore, pharmacological treatment of parasomnias during pregnancy is often limited due to potential teratogenic risks, which emphasizes the importance of early identification and appropriate non-pharmacological management strategies. Therefore, understanding the frequency of parasomnias and identifying associated risk factors in pregnant women is essential for improving awareness and developing better healthcare strategies.

Therefore, the present study aims to assess the sleep quality of pregnant women, with special emphasis on parasomnia-related symptoms, in Gujranwala, Pakistan. The findings of this study may contribute to improved recognition of sleep disorders during pregnancy and support the development of appropriate interventions to promote maternal and fetal health.

Literature Review

Sleep Changes in Pregnancy

Parasomnia in pregnancy is also very significant. Vivid dreams and nightmares are the most common among them. At the same time, it should be kept in mind that certain medical complications during pregnancy can also be linked with a higher chance of parasomnias, which results in poor sleep quality along with its known effects. (15)

Prevalence of Specific Parasomnias During Pregnancy

Very limited data are available on sleep-related disorders in pregnancy, especially parasomnia. A retrospective survey of 325 women showed that sleepwalking, bad dreams, and night terrors increase only after delivery, while other conditions such as anxiety and depression rise during pregnancy. Many pregnant women experience these sleep-related disorders, but unfortunately they are not diagnosed or even discussed in prenatal clinics. These studies confirmed that parasomnias and sleep-related disorders have very little epidemiological data for their better understanding.(16, 17)

Polysomnographic Pattern of Sleep During Pregnancy

Polysomnography is a systematized process used to collect parameters related to the physiology of sleep. A polysomnogram is a process that uses electromyogram, electrocardiogram, pulse oximetry, and electroencephalogram to assess the underlying etiology of sleep disturbances. The evaluation of sleep can be done using subjective methods as well as objective devices. Questionnaires are used to assess subjective sleep, while polysomnography is one of the gold-standard objective methods used to assess sleep. Sleep position varies in pregnancy, along with frequent changes in body position overnight. Lateral sleep position was mostly preferred, while supine sleep was also common. In half of the participants, the sleep onset position was one of the dominant positions throughout the night, which indicates that this position cannot reliably indicate the rest of the night. Encouragingly, non-supine sleep onset was also linked with less overall supine sleep. In pregnancies with restricted fetal growth, supine sleep onset was common.(18, 19, 20)

Poor Sleep & Maternal Health

Sleep disorders related to pregnancy are common, and due to these disorders, there can be serious health-related concerns for both mother and fetus. Therefore, these women need special care. Several studies indicate that identification and treatment of prenatal sleep disorders can reduce serious pregnancy-related health outcomes, which ultimately improves the health of both mother and fetus. Sleeplessness, delayed sleep onset, poor and discontinuous sleep quality, restless leg syndrome, and nocturnal awakenings are among the sleep-related problems that arise in pregnancy. Different complications can be an outcome of poor quality of sleep. Some of them are described in the following Fig. 3:(21)

Influence of Environment & Socioeconomic On Sleep

Sleep is very necessary for health and normal physiological functions. To achieve efficient sleep, there should be an appropriate environment that allows individuals to obtain good-quality sleep free of external disturbances. A significant relationship was observed between moderately poor sleep quality and level of education, as well as between very poor sleep quality and joblessness, both of which are indicators of socioeconomic status. Additionally, physically demanding work was also linked with increased rates of moderately poor sleep quality. Comparatively, women who engage in moderate physical activity have a lower chance of very poor sleep quality.(22, 23)

Longitudinal sleep Changes Across Trimesters

Progressively, the number of awakenings increases in pregnant women. Sleep disorders mostly occur in the first and third trimesters of pregnancy. Relatively, there is an increased risk of sleep disorders during the third trimester as compared to the second trimester.(24)

Prevalence & Global Distribution of Sleep Disturbances in Pregnancy

One study explains that one of the most prevalent problems that occurs in pregnancy is sleep disorders, markedly increasing from 63% during the first trimester to 80% in the second trimester. One study also suggests that a meta-analysis of the quality of sleep during pregnancy revealed that the incidence of sleep disorders in pregnancy is 45.7%. Previous studies also suggest that in pregnancy, the total prevalence of insomnia is 44%, which is relatively higher than in the general population. European countries like Spain, Norway, and Poland showed a greater risk of insomnia, with a prevalence of 53.6%. Asian countries like Japan, a developed country, also exhibit a higher prevalence of insomnia in pregnant women. The USA and Canada, part of North America, revealed a lower rate of insomnia as compared to the overall level, with a prevalence of 41%. In comparison, South America and Asia have a prevalence of 50.6% and 40.7%, respectively.(1, 14, 25)

Regional and Local Evidence

Previous cross-sectional study in India evaluated the sleep quality of 211 pregnant women using PSQI. This study A previous cross-sectional study in India evaluated the sleep quality of 211 pregnant women using the PSQI. This study found that 61.9% of the participants had poor sleep quality, and this figure increased to 83.3% in the second trimester. Due to very limited regional data on sleep quality among pregnant women, a study like this is significant in filling a clear gap in the local evidence.(26)

Risk Factors Associated with Poor Sleep

Poor sleep quality in acute settings increases the chance of insulin resistance. Poor sleep quality, including short sleep and insomnia, is linked with an increased chance of insulin resistance and diabetes mellitus. Fragmented sleep also alters ghrelin and leptin; these two hormones promote appetite and fullness, respectively. Any disturbance in these hormones leads to increased hunger and an altered sense of fullness, which ultimately increases the risk of obesity and diabetes mellitus. Several sleep disorders have been linked with a greater chance of stroke. In a large clinical study, women with Obstructive Sleep Apnea and an Apnea-Hypopnea Index greater than 10 were observed to have a greater chance of incident stroke as compared to women with a lower AHI.(27, 28)

Tools for the Assessment of Sleep Quality

The Pittsburgh Sleep Quality Index (PSQI) was first introduced in 1989 by David J. Buysse and colleagues for the assessment of sleep quality, especially in clinical populations, with a particular focus on patients with psychiatric problems. The PSQI consists of 19 self-report questions, comprising both fixed and open-ended questions. It assesses various aspects of sleep during the previous month, including sleep quality and sleep habits. The Epworth Sleepiness Scale is a simple, self-administered questionnaire used to evaluate the general level of daytime sleepiness. The STOP-BANG test was developed in 2008 by Chung F. et al. It is a very sensitive, simple, and easy-to-understand tool for Obstructive Sleep Apnea. STOP-BANG is an acronym for snoring history, tiredness during the day, observed stop of breathing, blood pressure, BMI, age, neck circumference, and gender.(29, 30, 31)

Management Strategies and Interventions

The European Sleep Research Society has developed a guideline for the proper treatment of chronic insomnia in adults, but these proposed guidelines do not focus on insomnia in pregnant women.

The following are some guidelines:

1. Good sleep hygiene
2. Use of cognitive behavioral therapy for insomnia

For treating non-pregnant patients with acute insomnia, benzodiazepine and non-benzodiazepine drugs are commonly used. Still, their use during pregnancy is limited because of their potential to produce teratogenicity and withdrawal symptoms in the fetus.Various sedative-hypnotic drugs mostly used for the treatment of insomnia fall under pregnancy categories C, D, or X. Significant health concerns, such as death or cancer, from these drugs have been reported. A large population-based study showed that zolpidem hurts pregnancy. Therefore, Cognitive Behavioral Therapy can be a safer option than medications.(13, 32)

Research Gap

While a substantial body of research has examined general sleep disturbances during pregnancy, including insomnia, sleep apnea, and shortened sleep duration and their links to poor maternal and fetal outcomes, this work has been concentrated mainly in Iran, East Asia, Europe, and North America. Parasomnia-related symptoms, such as nightmares, sleep paralysis, and other nocturnal disturbances, have received comparatively little attention, appearing only in a handful of clinical reviews touching on pregnancy. Notably, no existing study has used the Pittsburgh Sleep Quality Index to assess parasomnia symptoms in pregnant women within Pakistan specifically, and none has examined this issue in Gujranwala at all. Consequently, the prevalence,

severity and correlates of parasomnia symptoms in this population are unknown, limiting clinicians' ability to detect and treat these disturbances in antenatal care. A summary of relevant studies on sleep disturbances in pregnancy is presented in Table 1.

Table 1
Literature Review

Study Area	Author	Publication Year	Type of Study	No of Subjects	Location	Conclusion
Insomnia & deficiency of sleep during pregnancy	(14)	26 May, 2023	Cross-sectional study design	370 pregnant women	Iran	Results of this study proposed that there is a high prevalence of sleep disorders during pregnancy; however, a proper health education program on sleep can effectively improve the quality of sleep.
Pregnancy's effects on the sleep of mother	(33)	7 January, 2002	Observational study	325 pregnant women	Finland	Sleep quality is disturbed during the first trimester of pregnancy, while total time of sleeping increases. The frequency of disturbances during sleep, such as restless legs syndrome & nocturnal awakenings, both are maximum during the third trimester of pregnancy.
Factors associated with insomnia & sleepiness in the late third trimester during pregnancy	(34)	14 February, 2012	Cross-sectional observational study design	370 pregnant women	Spain	In the late third trimester of pregnancy, insomnias and sleep deprivation were more common.
Sleep duration and it's relation in early pregnancy and chances of GDM	(35)	September, 2021	Prospective cohort study	3692 pregnant women	China	Pregnant women with short sleep during their first trimester of pregnancy have a greater risk of GDM.
Diagnosis of sleep disorder in Pregnancy & chances of Preterm Birth	(36)	September, 2017	Observational study	2,265 pregnant women	USA	There is a greater risk of preterm birth due to insomnia and sleep apnea.
Impact of depressed mood & sleep disorders to	(37)	29 August, 2009	Cross-sectional observational	245 pregnant women	Canada	Women during pregnancy experience decreased health-

Study Area	Author	Publication Year	Type of Study	No of Subjects	Location	Conclusion
quality of life in pregnancy						related quality of life (HRQoL). Sleep disorders, mood depression, and anxiety associated with pregnancy were identified as important factors of lower HRQoL. Early detection and management of these determinants can improve mother's health and well-being in pregnancy.

Table 1
Literature studies of sleep and pregnancy

Association of stress & depression with the quality of sleep in pregnancy	**(38)**	**27 November, 2019**	**Prospective cohort study**	**1152 pregnant women**	**China**	**Quality of sleep in pregnant women is associated with prenatal stress & postnatal depression.**
The evaluation of education about healthy behavior on the quality of sleep during pregnancy with disorders of sleep	(39)	12 December, 2016	Quasi-experimental design study	30 pregnant women	Iran	Results of this study clearly indicates that healthy behavioral interventions and effective training may improve sleep disorders during pregnancy.
Evaluation of listening music on anxiety, stress, and the quality of sleep in pregnant women with sleep disorders	(40)	9 November, 2015	Randomized Controlled Trial	121 pregnant women	Taiwan	Listening to music for almost 2 weeks had significantly improved the quality of sleep, reduction in stress, and decrease in anxiety level in pregnancy.
Patterns & Indicators of the Quality of sleep in Pregnant Women of Taiwan	(41)	March/April, 2013	Cross-sectional, correlational study design	400 pregnant women	Taiwan	The findings of this study indicates that healthcare providers should give proper sleep counseling session to pregnant ladies.
Disturbance of sleep during pregnancy	(42)	28 March, 2016	Cross-sectional observational	100 pregnant women	England	About 68 participants reported some disturbance in their sleep in their whole pregnancy, but mostly this disturbance had taken place only during their 3rd trimester.

Association of stress & depression with the quality of sleep in pregnancy	**(38)**	**27 November, 2019**	**Prospective cohort study**	**1152 pregnant women**	**China**	**Quality of sleep in pregnant women is associated with prenatal stress & postnatal depression.**
Quality of sleep in pregnancy	(43)	15 June, 2017	Systematic review with meta-analysis of observational studies	11,002 pregnant women but this information came through 24 different studies.	Canada	This study indicated that 6.07 was average PSQI score in pregnancy which indicates poor sleep quality while the percentage of women that experienced poor quality of sleep was 45.7%.
Disorders of sleep and alertness in pregnant women	(44)	30 April, 2009	Cross-sectional observational	871 pregnant women	France	This study explained that individualized sleep quality is disturbed during the first trimester which increases during the whole time period of pregnancy.
Sleep & its disorders in pregnant women	(45)	4 August, 2020	Narrative literature review	Not available because it's a narrative literature review	India	Changes in sleep during pregnancy are associated with hormonal, anatomical, and mechanical factors.
Treatment considerations of insomnia in pregnancy	(46)	21 March, 2018	Narrative literature review	Not available because it's a narrative literature review	Pennsylvania	Prevalence of disturbance in sleep in pregnant women is high. Insomnia may arise due to changes in normal physiology in pregnancy. The safety data regarding antihistamines, benzodiazepines, and sedative hypnotics are supportive but some studies also indicates adverse

Association of stress & depression with the quality of sleep in pregnancy	**(38)**	**27 November, 2019**	**Prospective cohort study**	**1152 pregnant women**	**China**	**Quality of sleep in pregnant women is associated with prenatal stress & postnatal depression.**
						reactions, due to which further investigation is needed. There should be further studies on limited safety data of trazodone and melatonin.

Methods

Aims and Objectives

The aim of this study was to evaluate sleep-related disorders in pregnant women and interpret the findings using appropriate statistical techniques.

The specific objectives were:

- To determine the prevalence of sleep-related disorders among pregnant women in Gujranwala, Pakistan.
- To evaluate the quality of sleep in pregnant women using the PSQI.
- To determine the relationship between poor sleep quality and parasomnias.
- To identify safer approaches for the management of parasomnias, particularly proper patient counselling and aromatherapy, including lavender oil, as alternatives to pharmacological treatments.

Study Design and Setting

This was an analytical, observational cross-sectional study designed to evaluate sleep quality among pregnant women, with particular emphasis on parasomnia-related symptoms. The study was carried out over six months in Gujranwala, one of the largest cities in Punjab province, Pakistan. Participants were recruited from prenatal clinics and maternity hospitals within the city. A cross-sectional design was chosen because it offers a faster and comparatively reliable approach for estimating the prevalence of sleep-related disorders in a defined population.(47)

Participants

Pregnant women of any gestational age and any trimester, residing in Gujranwala, were eligible for inclusion. Eligible participants were aged 18 years or older, able to understand and complete the questionnaire independently, and willing to provide consent to take part. Women were excluded if they could not complete the questionnaire due to a language barrier, declined to participate, were not pregnant at the time of data collection, or submitted incomplete, missing, or duplicate responses.

A non-probability convenience sampling technique was used, since it is simple, inexpensive, and practical for recruiting participants directly from hospital settings within the available timeframe.(48)

Sample size was calculated using the Cochran formula, $N = Z^2PQ/e^2$, based on an expected prevalence of 76.3%, a 95% confidence interval, and a 5% margin of error, yielding a target of 278 participants. Of these, 262 women completed the questionnaire in full, giving a response rate of 94.2%.(49)

Ethical approval

was obtained from the institutional research ethics committee of Darsons Institute of Science & Technology, Gujranwala, prior to data collection. All participants were informed of the study's purpose and provided written consent, retained the right to withdraw at any stage, and had their data kept confidential throughout.

Materials and Data Collection

Data were collected using the Pittsburgh Sleep Quality Index (PSQI), a validated, self-report paper-based questionnaire consisting of 19 fixed and open-ended items that assess sleep quality over the preceding month. The PSQI generates scores across seven components: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. Each component is scored from 0 (no difficulty) to 3 (severe difficulty), and the seven component scores are summed to produce a Global PSQI score ranging from 0 to 21, with scores above 5 indicating poor sleep quality.(29)

Questionnaires were administered under the direct supervision of the researcher after eligible participants were briefed on the study's objectives. Completed responses were entered into an Excel spreadsheet and subsequently imported into IBM SPSS Statistics version 27.0 for analysis.

Statistical Analysis

Descriptive statistics (mean, standard deviation, median, minimum, and maximum) were used to summarize the distribution of total PSQI scores. The Shapiro-Wilk test was applied to assess normality and guide the choice between parametric and non-parametric methods. Frequency and percentage analysis was used to describe the distribution of participants by sleep quality category (good versus poor sleepers), individual PSQI component scores, and responses to specific items, including those related to parasomnia. Following statistically significant Cramér's V was calculated to determine the strength of association between individual sleep disturbance items and overall sleep quality.

Declaration of Generative AI Use

During the preparation of this manuscript, the author(s) used Claude (Anthropic) to assist with language editing and restructuring of the manuscript text. After using this tool, the author(s) reviewed and edited the content as needed and take full responsibility for the accuracy and integrity of the final published work.

Results

Descriptive Statistics of Total PSQI Score

Table 2
Descriptive Statistics of Total PSQI Score

Statistics		
PSQI Total		
N	Valid	262
	Missing	0
Mean		7.57
Median		6.00
Std. Deviation		4.266
Minimum		0
Maximum		21

A total of 262 participants were included in the analysis, with no missing data. The mean PSQI score was 7.57 ± 4.27, with a median of 6 and a range of 0–21. Since the mean PSQI score was greater than the cutoff value of 5, the participants, on average, had poor sleep quality (Table 2). The distribution of total PSQI scores is shown in Fig. 4.

Normality of the Total PSQI Score

Table 3
Normality of the Total PSQI Score

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
PSQI Total	.147	262	.000	.938	262	.000

The normality test showed that the PSQI total scores were not normally distributed ($p < 0.001$). Therefore, non-parametric tests were considered appropriate for data analysis (Table 3). The detrended normal Q–Q plot confirming this deviation from normality is shown in Fig. 5.

Frequency of Good vs Poor Sleep Quality (PSQI ≤ 5 vs > 5)

Table 4
Frequency of Good vs Poor Sleep Quality

Sleep Quality					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Good Sleep Quality**	97	37.0	37.0	37.0
	Poor Sleep Quality	165	63.0	63.0	100.0
	Total	262	100.0	100.0	

Out of 262 participants, 165 (63.0%) had poor sleep quality, while 97 (37.0%) had good sleep quality. This indicates that poor sleep quality was more common among the participants in this study (Table 4). The distribution of good versus poor sleep quality is shown in Fig. 6.

Effect Size for Chi-Square Associations Using Cramér's V

Table 5
Effect Size for Chi-Square Associations

Sleep Disturbance Item	Cramér's V	Effect Size	p-value	Interpretation
Q5a	0.656	Strong	< 0.001	Significant
Q5b	0.338	Moderate	< 0.001	Significant
Q5c	0.112	Weak	0.350	Not Significant
Q5d	0.329	Moderate	< 0.001	Significant
Q5e	0.336	Moderate	< 0.001	Significant
Q5f	0.147	Weak	0.128	Not Significant
Q5g	0.405	Strong	< 0.001	Significant
Q5h	0.376	Moderate	< 0.001	Significant
Q5i	0.310	Moderate	< 0.001	Significant
Q5j	0.153	Weak	0.105	Not Significant

Cramér's V analysis showed that most significant sleep disturbance items had moderate to strong associations with sleep quality. However, getting up to use the bathroom, feeling too cold, and other reasons showed weak and non-significant associations ($p > 0.05$) (Table 5).

Discussion

Mean global Pittsburgh Sleep Quality Index (PSQI) score in 262 pregnant women in Gujranwala was 7.57 ± 4.27 (median 6.00, range 0–21). Using the conventional cut-off of > 5, 165 (63.0%) participants were classified as poor sleepers and 97 (37.0%) as good sleepers (Table 4). These results support the idea that poor sleep quality

was the norm rather than the exception in this population and speak directly to the aims of the study to assess the prevalence of sleep disturbance and estimate overall sleep quality in pregnancy.

The distance between the mean (7.57) and the lower median (6.00) suggests a right-skewed distribution. Most women had mild to moderate sleep impairment, and a smaller subgroup had scores close to the maximum impairment of 21, which pulled up the mean. The relatively high standard deviation also reflects how unevenly the sleep quality was distributed in the sample, from no impairment to the most severe global score.

The departure from normality was statistically confirmed: the Kolmogorov-Smirnov test ($D = 0.147$, $df = 262$, $p < .001$) and the Shapiro-Wilk test ($W = 0.938$, $df = 262$, $p < .001$) were significant, indicating that PSQI scores were not normally distributed (Table 3). This is in line with the descriptive pattern noted above, where the mean was greater than the median, and supports the conclusion that sleep disturbance was disproportionately severe in a subset of participants rather than uniformly mild across the sample. The non-normality justified the use of non-parametric methods (Mann–Whitney U, Spearman's correlation, and chi-square/Cramér's V) as appropriate to investigate relationships between PSQI components, individual disturbance items and overall sleep quality rather than parametric alternatives which assume normally distributed data.

Poor sleep quality was reported by almost two-thirds of the participants (63.0%), which was significantly higher than that of those with good sleep quality, as shown in the bar graph comparing the two groups. This establishes disturbed sleep as a major issue in this population rather than an isolated complaint.

This prevalence sits within, though toward the higher end of, the range reported internationally. A large prospective cohort in China following women across the third trimester reported a mean global PSQI of 8.11 ± 5.41, with 58.2% classified as poor sleepers, closely mirroring the present findings. A comprehensive meta-analysis of perinatal and postnatal women pooled a total PSQI score of 7.54, essentially identical to the mean obtained here. Notably, poor sleep quality during pregnancy has been prospectively linked to greater postpartum anxiety in cohort data, suggesting that the sleep disturbance measured here is unlikely to be confined to pregnancy and may continue into the postnatal period.(38, 48, 49)

Comparisons within Pakistan are especially instructive. Another study among 114 pregnant women in Rawalpindi using the Urdu validated PSQI showed an even higher prevalence of poor sleep, with 73.7% of the women being poor sleepers. A larger Punjab-based study of 516 pregnant women, most of whom were native to Punjab province, similarly found that more than half reported poor sleep quality. Against this regional backdrop, the 63.0% prevalence found in Gujranwala fits comfortably within the pattern already documented among Pakistani pregnant women, suggesting that elevated rates of poor sleep during pregnancy may be a consistent regional finding rather than a feature specific to one sample.(50, 51)

By contrast, other populations have reported somewhat lower prevalence. A Turkish study of 570 women in their last trimester found a mean PSQI of only 5.98 ± 3.31, with 48.9% classified as poor sleepers, while an Iranian study restricted to first-time (primigravid) mothers reported a considerably higher mean of 13.8 and a prevalence of 76.3%. Together, these comparisons suggest that prevalence estimates vary meaningfully with gestational timing, parity, and possibly cultural and healthcare-access factors, but that a prevalence in the 55–75% range, as seen here, is broadly typical rather than exceptional. This is also consistent with sleep-

disturbance patterns reported among students, healthcare workers, and general populations, where stress, lifestyle demands, and screen exposure are recurrent contributors to poor sleep.(52, 53)

Analysis of the individual PSQI components showed that participants most commonly experienced difficulty with subjective sleep quality, sleep latency, sleep duration, sleep disturbances, and daytime dysfunction. In contrast, sleep efficiency was relatively preserved and use of sleep medication was minimal. This pattern of component-level involvement is broadly in line with work examining how the PSQI's underlying component structure behaves across different stages of pregnancy, which has similarly found that specific domains, rather than the scale uniformly, drive overall impairment as gestation progresses. It is important to point out that sleep disturbance and daytime dysfunction are prominent here. This points beyond simple difficulty falling or staying asleep to a broader impact on daily functioning. This highlights the benefit of nonpharmacologic interventions, such as sleep hygiene education and behavioral strategies, and the need for early identification and treatment of parasomnia-related and other sleep problems in this population.(54)

Cramér's V analysis indicated that the majority of the sleep disturbance items (Q5a–Q5j) were statistically significantly associated with the overall sleep quality, except for Q5c, Q5f, and Q5j, which were weakly and non-significantly associated. The strongest associations were for Q5a and Q5g ($p < 0.001$), but moderate associations were also observed for Q5b, Q5d, Q5e, Q5h and Q5i (Table 5). The results suggest that some specific, identifiable sleep disturbances, including those related to parasomnia, contribute disproportionately to poor sleep quality overall, as opposed to all disturbance items contributing equally.

Taken together, these findings indicate that clinical and public health responses to antenatal sleep problems should target the sleep disturbances that are most strongly associated. Such interventions may offer benefits beyond pregnancy itself, given the established relationship between antenatal sleep quality and postpartum anxiety. Specific measures such as sleep hygiene education, behavioral therapy, and routine screening for parasomnia may significantly reduce the burden of sleep disturbance and improve sleep health and daytime functioning among pregnant women in this and similar populations.(48)

Limitations

Some limitations should be considered when interpreting these findings. Because participants were recruited through convenience sampling at hospitals and clinics, the sample may not represent all pregnant women in Gujranwala, particularly those with less access to antenatal care. The cross-sectional design of the study also means we are only able to take a snapshot in time, so it is not possible to state how sleep quality changes throughout pregnancy or to draw firm conclusions about cause and effect. Sleep quality was assessed by self-report using the PSQI rather than objective measures such as actigraphy which may incur recall bias. The study was conducted in a single city, and the findings may not be generalizable to other parts of Pakistan. Finally, we did not include gestational age, parity and psychosocial stress in the analysis and these may have affected some of the associations found.

Conclusion

The present study revealed that a large proportion of the pregnant women of Gujranwala have poor sleep quality, with nearly two-thirds (63%) being poor sleepers and a mean PSQI score of 7.57, which is well above

the clinical cut-off of 5. This is very much in line with patterns elsewhere in Pakistan and the world.

Poor sleep quality was strongly associated with several disturbances, including difficulty falling asleep, frequent waking, breathing difficulty, snoring, being too hot, bad dreams, pain and daytime dysfunction, with the latter having the strongest association. Nighttime urination was common, but not significantly associated with overall sleep quality, contrary to the usual assumption that it is a primary driver of pregnancy-related sleep loss.

These findings support routine sleep screening in antenatal care and early non-pharmacological interventions such as sleep hygiene education, behavioural strategies and aromatherapy that can improve maternal wellbeing without the risks of medication in pregnancy. Larger samples at different time points in pregnancy are needed to replicate these patterns and guide more focused interventions, and longitudinal research is required.

Abbreviations

PSQI
Pittsburgh Sleep Quality Index
NREM
Non–Rapid Eye Movement (sleep)
REM
Rapid Eye Movement (sleep)
GABA
Gamma–Aminobutyric Acid
CNS
Central Nervous System
AHI
Apnea–Hypopnea Index
BMI
Body Mass Index
GDM
Gestational Diabetes Mellitus
IBM SPSS
International Business Machines Statistical Package for the Social Sciences

Declarations

Ethics approval and consent to participate

Ethical approval for this study was obtained from the institutional research ethics committee of Darsons Institute of Science & Technology, Gujranwala, comprising Dr. Fizza Sarfraz, Dr. Ayesha Munir, and Dr. Zain Sherazi. All participants were informed about the objectives and purpose of the study and provided written informed consent prior to participation. Participants were free to withdraw from the study at any time, and confidentiality of participants and data was maintained throughout.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

AN performed the literature search, data collection, data analysis, and drafted the manuscript. MG prepared the manuscript, performed data cleaning, and organized the Excel sheet used for data analysis. ZZ, AK, and HA contributed to data collection and assisted in writing the manuscript. All authors read and approved the final manuscript.

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Authors' information

Not applicable.

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Figures

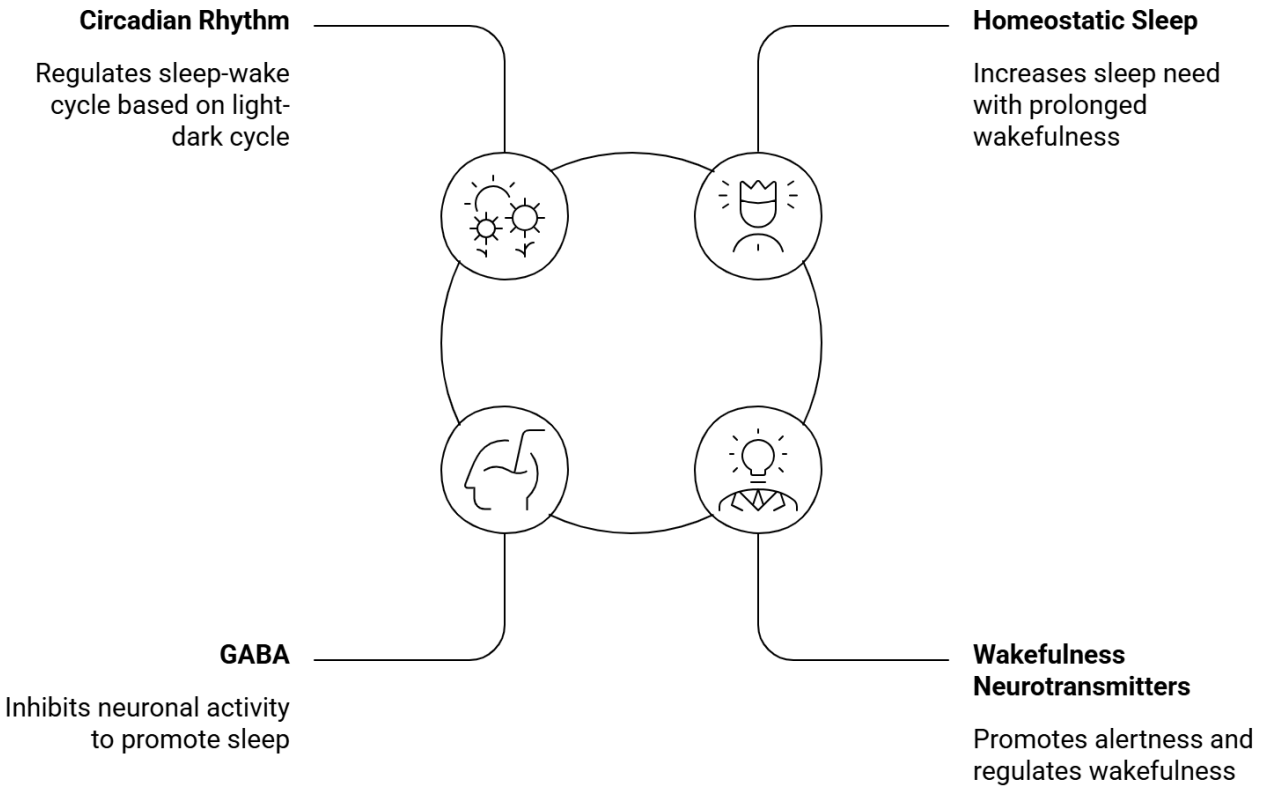


Figure 1

Physiology of normal sleep(1, 2, 3)

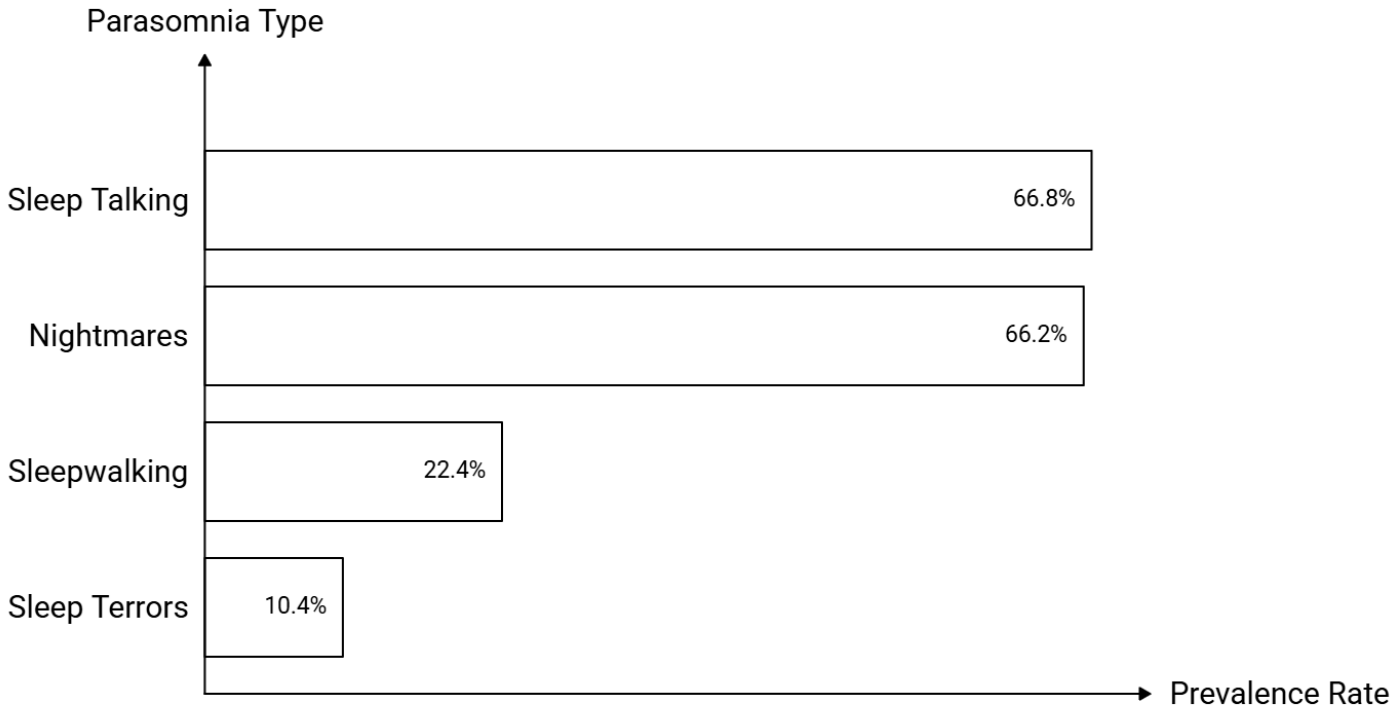


Figure 2

Epidemiological data of parasomnias(11, 12, 13)

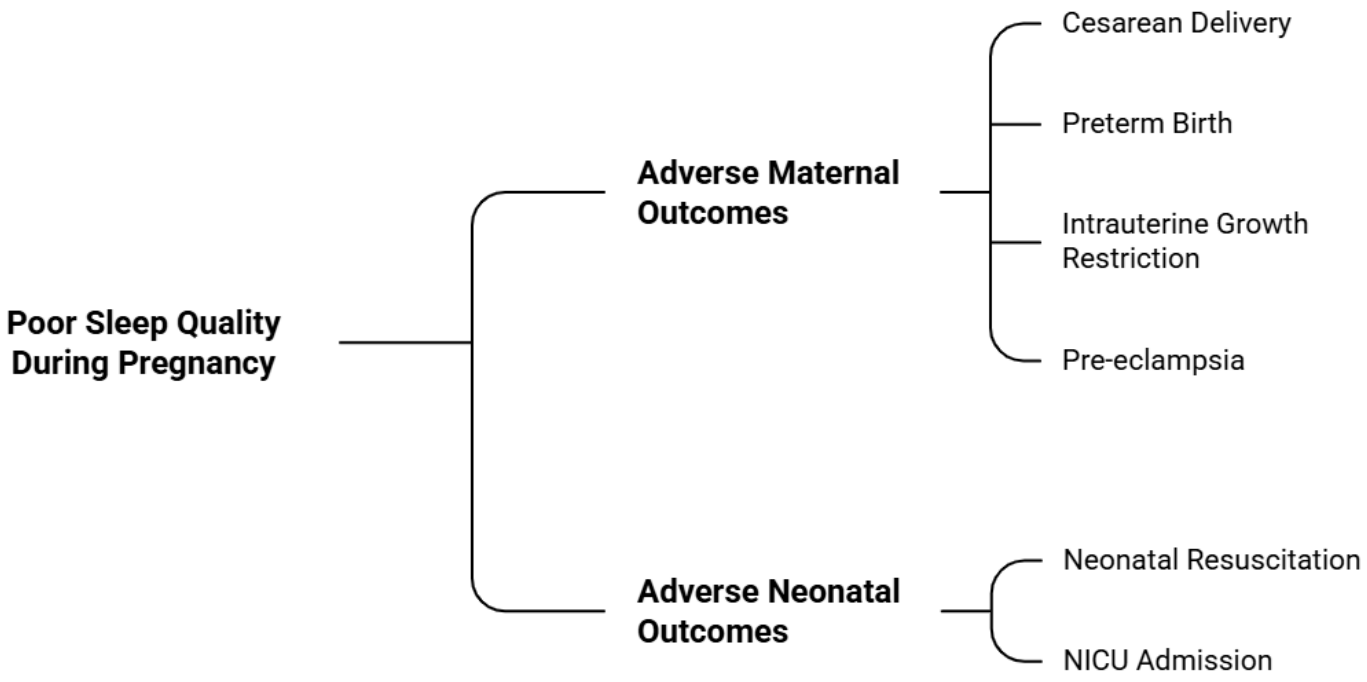


Figure 3

Complications leading to poor sleep quality(21)

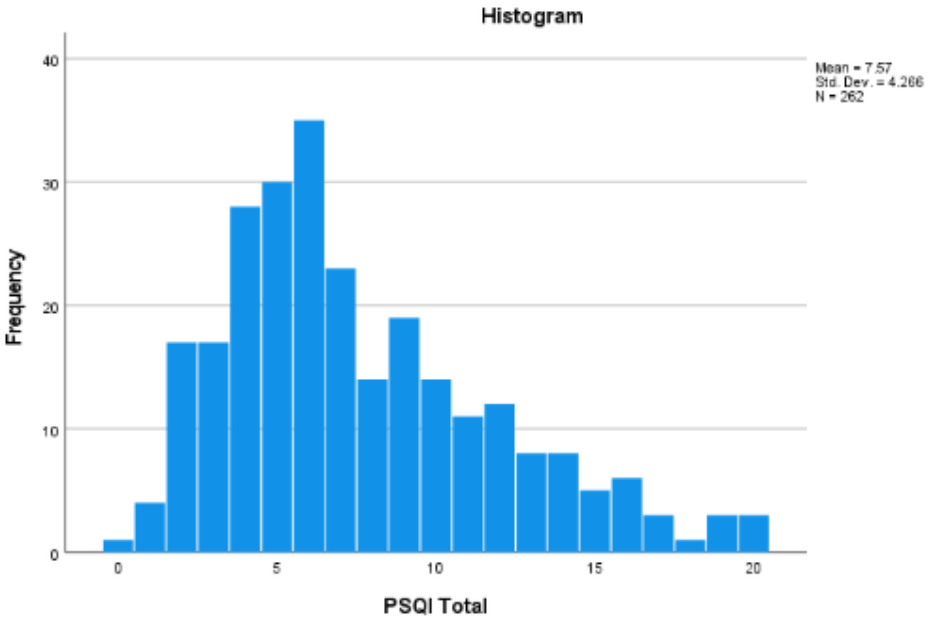


Figure 4

Histogram showing the distribution of total PSQI scores

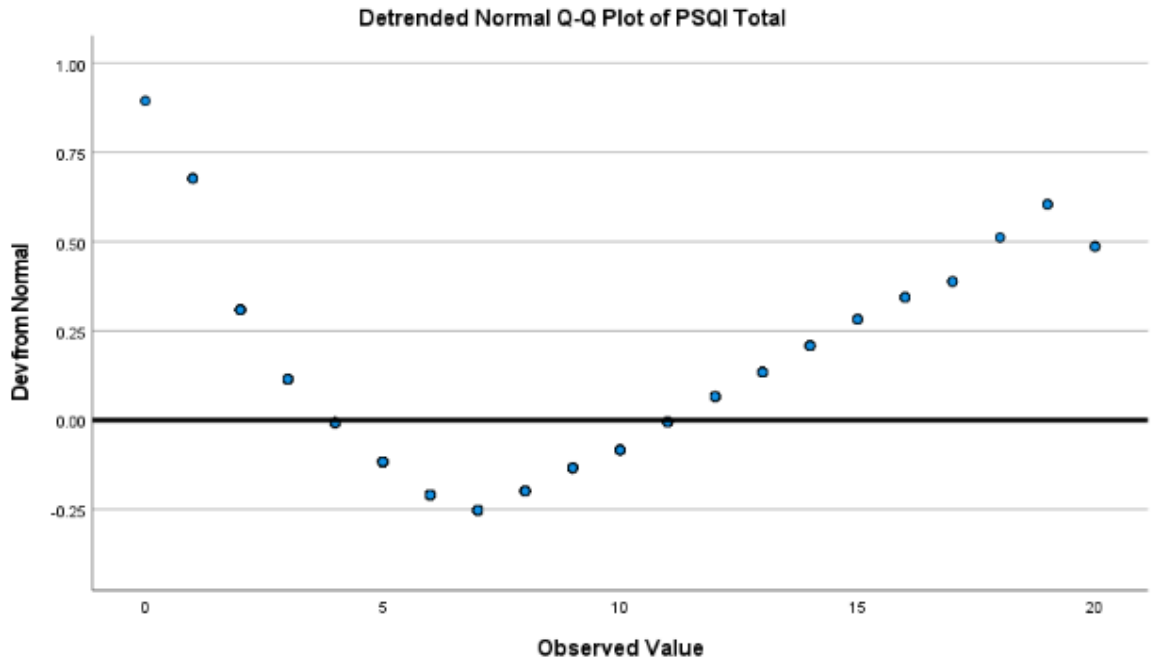


Figure 5

Detrended normal Q–Q plot of the total PSQI score



Figure 6

Histogram showing Frequency of Good & Poor sleep qaulity