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Insomnia and sleep quality among women during the perinatal period

Nagla El-Sherbeeny[1], Ashraf El Tantawy[2], Omneya Ibrahim[2], Mona Elsayed[2], Noha El-Okda[3] and Haydy Hassan[2]*

Abstract

Background: Insomnia is the most common sleep disorder affecting sleep quality and quality of life among women during the perinatal period. The aim of the study is to study the frequency of insomnia and sleep quality among perinatal women and their effect on quality of life: 131 participants; 64 perinatal and 67 control groups from the out-patient clinics of Suez Canal University Hospital, Ismailia, Egypt. DSM-5 criteria were used to diagnose insomnia. Sleep quality was assessed using PSQI, and SF-36 questionnaire was used for assessment of health-related quality of life.

Results: Insomnia was statistically significant higher among the perinatal group than the control; 28.1% and 10.4%, respectively ($P < 0.05$). The perinatal women had poor sleep quality as compared with the control group with a higher mean global PSQI score; 8.02 ± 2.97 and 4.97 ± 2.45, respectively ($P < 0.05$). The quality of life in the perinatal group was lower than the control group with scores of 54.96 ± 14.63 versus 62.34 ± 14.63, respectively.

Conclusions: Insomnia and poor sleep quality are found in higher frequency in perinatal women than their counter-part control. The study also showed a significant impact of these changes on maternal HRQoL.

Keywords: Insomnia, Sleep quality, Perinatal period

Background

Sleep is an essential physiological function in humans, affecting their wellness at both physical and psychological domains [10]. Sleep serves important roles for human health keeping the body physiological processes at the highest possible level of performance. It functions to conserve energy, repair cells, modulate immune functions, optimize brain circuits, and consolidate memory and learning [42].

Insomnia is the most common sleep disorder encountered both in the general population and in psychiatric settings. It is defined as the difficulty to initiate sleep, stay asleep, or having a non-restorative sleep associated with day-time distress recurring for at least three times per week for at least a month [36]. Female gender as a

risk factor for insomnia. Gender-specific risk factors for insomnia in females include the higher prevalence of depression and anxiety among women, environmental, and social factors, as well as hormonal factors [9, 41].

Sleep quality is a predictor of vitality, physical, and mental health. The focus is relevant to women in the perinatal period, especially in pregnancy when they become progressively aware of their wellbeing [24]. As pregnancy progresses, sleep quality decreases in many pregnant women and the percentage of women defined as poor sleepers increases significantly [39].

Disruption and fragmentation of nighttime sleep are common in healthy pregnant and postpartum women [31]. For perinatal women, advanced maternal age, fluid retention, anemia, discomfort as uncomfortable sleeping positions, and body pain, as well as mood disturbance, were correlates of sleep disturbances and quality [53]. However, the sleep changes during pregnancy and sleep deprivation that is common early in the

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postpartum period may increase risk for postpartum depression [14].

Maternal insomnia and poor sleep quality are important predictors of woman's health. Insomnia and low sleep efficiency during pregnancy results in chronic sleep loss. This chronic sleep loss was associated with adverse outcomes, including gestational diabetes, preeclampsia, increased length of labor, need for cesarean delivery, and preterm birth [33]. Researchers found a prospective positive relationship between perinatal maternal symptoms of insomnia and problems in social-emotional child development [3].

Considering the significance of perinatal period in women's life and its impact on child psychological development, studying sleep quality and its influence on the women's overall life quality measures is worthy of research. Lack of sleep or the presence of sleep disorders can greatly impact a woman's daily life, including her societal roles in the work force and as the primary caregiver in the family [28]. Sleep disturbances affect maternal daily functioning with daytime fatigue and reduced energy impacting the childcare. This may lead to child neglect and less child stimulation and maternal happiness [17].

Deteriorated sleep quality affects several aspects of women functioning, physical, emotional/cognitive, and social. These changes reflect on women QoL [26]. Pregnant women had lower QoL scores as compared with non-pregnant controls. The reduction was marked in the second and third trimester than those reported in the first trimester [44].

Insomnia in pregnancy is a treatable condition with pharmacological interventions, as well as behavioral strategies may treat sleep disturbance. Minimizing modifiable factors for insomnia and increasing sleep quality play an important role to avoid adverse pregnancy outcomes such as maternal-fetal morbidity, mortality, anxiety, depression, and cognitive impairments [40, 54].

There are few studies examining insomnia symptoms and sleep quality and their effect on quality of life in perinatal women. Such studies are warranted and can inform interventions targeting sleep disturbance to enhance treatment outcomes and improve quality of life in this patient population [45].

Methods
Type of the study: cross-sectional descriptive study
Study site: The study was carried out in gynecology and obstetrics outpatient clinic in Suez Canal University Hospital.

Study population
Case group: 64 women in the perinatal period who were pregnant or 1 year postnatal and aged from 18 to 50 years. Women who had current substance use or had intellectual disability or with past or current psychiatric history or with other medical conditions interfering with sleep were excluded from this study.

Control group
A matched group of 67 healthy women (non-pregnant or women who completed at least 1 year after delivery). The control group was recruited from other outpatient clinics as well; women who met the criteria and agreed to participate and were accompanying a friend or a family member to the clinic.

Study sampling
All women fulfilling the inclusion criteria were included consecutively until the calculated sample size was reached.

Study procedures
All the procedures were explained to every woman. Then, after obtaining her consent, the following were done:

– Socio-demographic information (age, place of residence, occupation, and educational level), medical history (chronic illness, psychiatric diagnoses, and medications), reproductive history (gestational age, number of children), smoking, caffeine use and recreational drug habits, and family history
– A semi-structured psychiatric interview was used to diagnose insomnia according to the DSM-5 [4]
– Quality of sleep was measured using Pittsburg Sleep Quality Index (PSQI) in its Arabic version. The Arabic version that was previously validated was used [43]. This self-administered questionnaire assesses quality of sleep during the previous month and contains 19 self-rated questions yielding seven components. The PSQI is useful in identifying good and poor sleepers [7].
– Health-related quality of life was measured with the 36-item Short Form (SF-36). The SF-36 is a 36-item self-administered questionnaire that yields scores for eight domains, with higher scores indicating better functioning [52]. SF-36 was construct validity was confirmed for the eight domains and the two summary scores [50]. The SF-36 was translated into Arabic with Egyptian dialect, the reliability was examined following the international guidelines, the reported high Cronbach's alpha was 0.8, and it was

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concluded that SF-36 is reliable enough to be used in Egyptian population [15].

Statistical analysis

Data entry and analysis were done via IBM SPSS software, version 22.0 [20]. Quantitative data were expressed as means and standard deviation while qualitative data were expressed as numbers and percentages. The Student's *t* test was used to test significance of difference for quantitative variables. To compare qualitative variables between the two groups, Fisher's exact test and and chi-square were used. The correlation between PSQI scores and scores of quality of life summary scores was evaluated by Spearman correlation coefficient. The association of insomnia with other tested parameters was estimated by chi^2 test and the appropriate correlation coefficient according to the type of data (Cramer's V or Eta square). A probability value of *P* value > 0.05 was considered statistically significant.

Results

The sociodemographic characteristics of the study groups are shown in Table 1. There were no significant differences between the perinatal and control regarding the age, educational level, marital status, number of children, residence, economic status, or occupation. The mean age of the perinatal and the control groups were 28.7 ± 5.6 years and 30.5 ± 6.03 years, respectively. The educational level of studied population was comparable. The "read and write" category had the lowest number of females (5 in each study group). Nearly half (52.2%) of the control group was in "middle and high school" versus 40.6% of perinatal women. In "college level and higher" category, 51.6% of the perinatal women were in this group verus 40.3% in the control group. Most of the participants were married (98.4% of perinatal group and 94.8% in the control group). Regarding the number of children, about two thirds of the perinatal group has 2 or less children versus 65% of the control. The percentage of women with more than 2 children was 23.4% in the perinatal group versus 34.3% in the control group. Most participants resided in urban areas representing 79.7% and 74.6% of the perinatal group and control group, respectively and had a moderate socioeconomic status (73.4% in the perinatal and 58.2 in the control group). The low socioeconomic status came next with 21.9% in the perinatal and 31.3% in the control group. More than half of females in each group were employed, 65.6% and 56.7% in the perinatal and control groups, respectively. There was no statistically significant difference in the characteristics reported by the two groups. Only 3% of the control group were smokers while all women in the perinatal group were

Table 1 Sociodemographic and clinical characteristics of the studied groups

Variables	Perinatal women % (*n* = 64)	Control % (*n* = 67)	*P* value
Age in years (Mean ± SD)	28.70 ± 5.61	30.58 ± 6.03	0.67
Residence			
Urban	51 (79.7)	50 (74.6)	0.49
Rural	13 (20.3)	17 (25.4)	
Socioeconomic status			
Low	14 (21.9)	21 (31.3)	
Moderate	47 (73.4)	39 (58.3)	0.18
High	3 (4.7)	7 (10.4)	
Marital status			
Married	63 (98.4)	63 (94.0)	
Widow	0 (0.0)	1 (1.5)	0.62
Divorced	1 (1.6)	3 (4.5)	
Number of children			
0–2	49 (76.6)	44 (65.7)	0.18
>2	15 (23.4)	23 (34.3)	
Education			
Illiterates	0 (0)	0 (0)	
≤ 6 years of education	5 (7.8)	5 (7.5)	
6–12 years of education	26 (40.6)	35 (52.2)	0.39
>12 years of education	33 (51.6)	27 (40.3)	
Occupation			
Employed	42 (65.6)	38 (56.7)	0.29
Smoking	0.0	2 (3.0)	0.49
Caffeine use	46 (71.9)	50 (74.6)	0.72
Chronic illnesses	4 (6.3)	8 (11.9)	0.26
Medications	4 (6.3)	6 (9.0)	0.74

Data presented as numbers and percentages (in parenthesis). *P* value is statistically significant at < 0.05

There were no significant differences between the perinatal and control regarding the age, educational level, marital status, number of children, residence, economic status, or occupation. There was no statistically significant difference in the characteristics reported by the two groups. The two groups were matched when compared for the presence of chronic medical conditions and the use of drug

non-smokers. On the other hand, the use of caffeinated beverages tea and coffee was reported by 71.9% of the perinatal group versus 74.6% in the control group. The two groups were matched when compared for the presence of chronic medical conditions and the use of drugs. The frequency of insomnia in the study groups is shown in Table 2. There was a statistically significant difference between groups regarding the distribution of insomnia. In the perinatal group 18 women (28.1%) met the DSM-V criteria for insomnia diagnosis versus 7 (10.4%) cases in

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Table 2 Prevalence of insomnia and subjective sleep quality among the studied groups

Group	Insomnia *n*(%)				Total *n*(%)	*P* value
Control	7 (10.4)				67 (100)	
Perinatal women	18 (28.1)				64 (100)	0.01*
Subjective sleep quality						
	Very good *n*(%)	Fairly good *n*(%)	Fairly bad *n*(%)	Very bad *n*(%)		
Control	19 (28.4)	40 (59.7)	7 (10.4)	1 (1.5)	67 (100)	0.001*
Perinatal	5 (7.8)	32 (50)	20 (31.3)	7 (10.9)	64 (100)	

There was a statistically significant difference between groups regarding the distribution of insomnia. Demonstrates the distribution of subjective sleep quality in perinatal women versus the control group. Reported subjective sleep quality was significantly different between the two groups
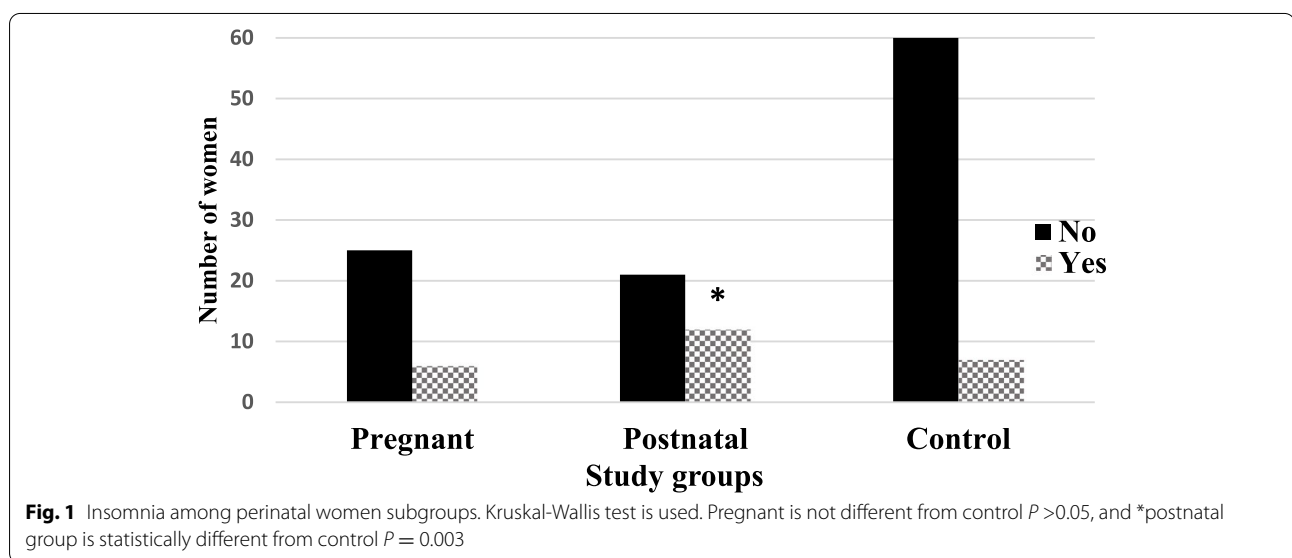
* *P* value was considered significant at < 0.0

Fig. 1 Insomnia among perinatal women subgroups. Kruskal-Wallis test is used. Pregnant is not different from control *P* >0.05, and *postnatal group is statistically different from control *P* = 0.003

the control group. Subjective sleep quality was significantly different between the two groups. 50% of perinatal women reported "fairly good" sleep quality versus a nearly 60% in the control group. However, more perinatal women (31.3%) reported "fairly bad" sleep quality as compared to the control group (10.4%). In the "very bad" sleep quality category nearly 11% of perinatal women were in this category versus only 1.5% in the control group. Frequency of insomnia in the perinatal women subgroups. The postnatal subgroup of perinatal women showed the highest frequency of insomnia (36.4%) while only 6 women (19.4%) in the pregnant group met the criteria for diagnosis. The difference between the control and postnatal groups was statistically significant while frequency of insomnia were comparable between pregnant women and controls as shown in Fig. 1. the Pittsburg sleep quality index components and its global score are compared in both groups. The perinatal group had a higher mean PSQI global score than control group indicating poorer sleep quality. This difference between the
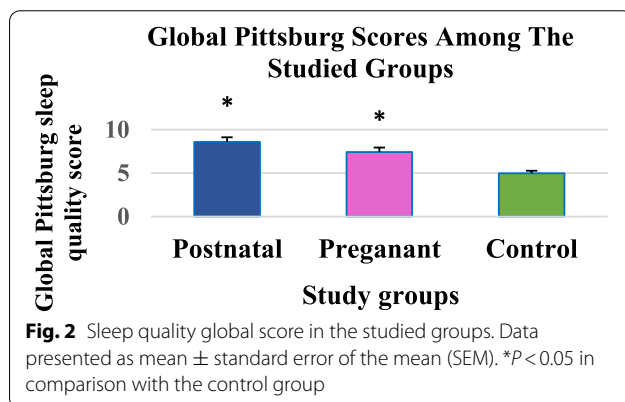
two groups was statistically significant. All components of the PSQI -except for the use of sleep medication- were statistically different between the two groups (*p* <0.05). The perinatal group had higher scores with the highest score in the sleep disturbance component (Table 3). Postnatal women had a higher global score than pregnant women but the difference between the 2 subgroups did not reach statistical significance (Fig. 2). SF-36 total score was statistically different between the two groups with perinatal women having calculated lower scores than the controls (54.96 ± 14.63 versus 62.34 ± 14.63), respectively. There was a statistically significant difference between the two groups in the PCS components. The perinatal women group had a lower mean PCS score of 55.36 ± 18.46 versus 63.32 ± 17.35 in the control group. However, the MCS component scores were not statistically different between the perinatal women and the control group. Of the SF-36 subscales; physical functioning, role physical, and vitality were significantly lower in perinatal women than in the control group while

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Table 3 Quality of sleep in the studied groups using the PSQI

PSQI variables	Mean ± SD		
	Perinatal women (n = 64)	Control (n = 67)	P value
Subjective sleep quality	**1.45 ± 0.79**	**0.85 ± 0.66**	**0.001***
Sleep latency	**1.39 ± 0.75**	**0.84 ± 0.97**	**0.001***
Sleep duration	**1.25 ± 0.84**	**0.66 ± 0.59**	**0.001***
Sleep efficiency	**0.84 ± 1.07**	**0.21 ± 0.44**	**0.001***
Sleep disturbance	**1.83 ± 0.66**	**1.46 ± 0.56**	**0.001***
Use of sleep medications	**0.06 ± 0.30**	**0.18 ± 0.42**	**0.03**
Day time dysfunction	**1.20 ± 0.74**	**0.78 ± 0.55**	**0.001***
Global PSQI	**8.02 ± 2.97**	**4.97 ± 2.45**	**0.001***

The perinatal group had a higher mean PSQI global score than control group indicating poorer sleep quality. This difference between the two groups was statistically significant. All components of the PSQI—except for the use of sleep medication—were statistically different between the two groups ($p < 0.05$). The perinatal group had higher scores—except for the use of sleep medication—with the highest score in the sleep disturbance component

* P value < 0.05 in comparison with the control group

Global Pittsburg Scores Among The Studied Groups

Fig. 2 Sleep quality global score in the studied groups. Data presented as mean ± standard error of the mean (SEM). *$P < 0.05$ in comparison with the control group

Table 4 Quality of life among different studied groups according to SF-36

Variables	Perinatal women (n = 64)	Control (n = 67)	P value
MCS	**54.62 ± 17.74**	**54.96 ± 17.60**	0.96
PCS	**55.36 ± 18.46**	**63.32 ± 17.35**	**0.012***
Physical functioning	57.26 ± 19.76	67.54 ± 20.14	**0.004***
Role physical	47.66 ± 37.98	62.69 ± 34.37	**0.023***
Bodily pain	60.27 ± 25.13	68.88 ± 21.79	0.063
General health	56.33 ± 15.36	59.25 ± 14.17	0.312
Vitality	43.67 ± 16.81	55.60 ± 17.37	**0.001***
Social functioning	62.12 ± 21.59	64.36 ± 22.11	0.66
Role emotional	55.73 ± 38.97	50.74 ± 36.86	0.445
Mental health	57.00 ± 15.76	62.20 ± 15.11	**0.045***
Total SF-36	**54.96 ± 14.64**	**62.34 ± 14.63**	**0.003***

SF-36 total score was statistically different between the two groups with perinatal women having calculated lower scores than the controls. There was a statistically significant difference between the two groups in the PCS components. However, the MCS component scores were not statistically different between the perinatal women and the control group. Of the SF-36 subscales; physical functioning, role physical, and vitality were significantly lower in perinatal women than in the control group while the scores of Bodily pains, general health, social functioning, role emotional, and mental health were not statistically significant between the two groups

MCS Mental Component Summary, *PCS* Physical Component Summary

* $P < 0.05$ in comparison with the control group

the scores of Bodily pains, general health, social functioning, role emotional, and mental health were not statistically significant between the two groups (Table 4). There were significant correlations between the PCS and MCS and all the Pittsburg quality of sleep components scores except for the for the use of sleep medication scores. Both quality of life scores PCS and MCS had significant correlations with global PSQI score in the studied population (Table 5). There is a negative correlation between global PSQI scores and total scores of the quality of life questionnaire (SF-36) (Fig. 3).

Discussion

Perinatal period is a significant time in women's life. It signifies alteration in their social role and carries with it multiple physical and psychological changes. This study

was designed to detect the frequency of insomnia, assess sleep quality, and health-related quality of life measures in perinatal women.

In the present study, a woman was considered to have insomnia when she fulfills DSM-5 criteria for insomnia. Sleep quality was assessed using PSQI and for health-related quality of life, SF-36 questionnaire was used, and responses were analyzed according to previous recommendations [51].

In this study, there were no significant differences in the sociodemographic characteristics of the study groups. The two groups were comparable in age, educational level, marital status, number of children, residence, economic status, smoking, and occupation. The mean age of the perinatal and the control groups were 28.7 ± 5.6 years and 30.5 ± 6.03 years, respectively. The two groups had low and non-significant difference in the presence of chronic disease conditions and the regular use of medications (Table 1).

In this study, there was a higher percentage of women fulfilling the criteria of insomnia in the perinatal group than in the control group, 28.1% and 10.4%, respectively. The difference was statistically significant ($p < 0.05$) (Table 2). This percentage in the control group is consistent with another Egyptian study, Beni-Suef City, that found insomnia in 11.6% of healthy women, $n = (4122)$ [5]. The slight difference, however, may be attributed
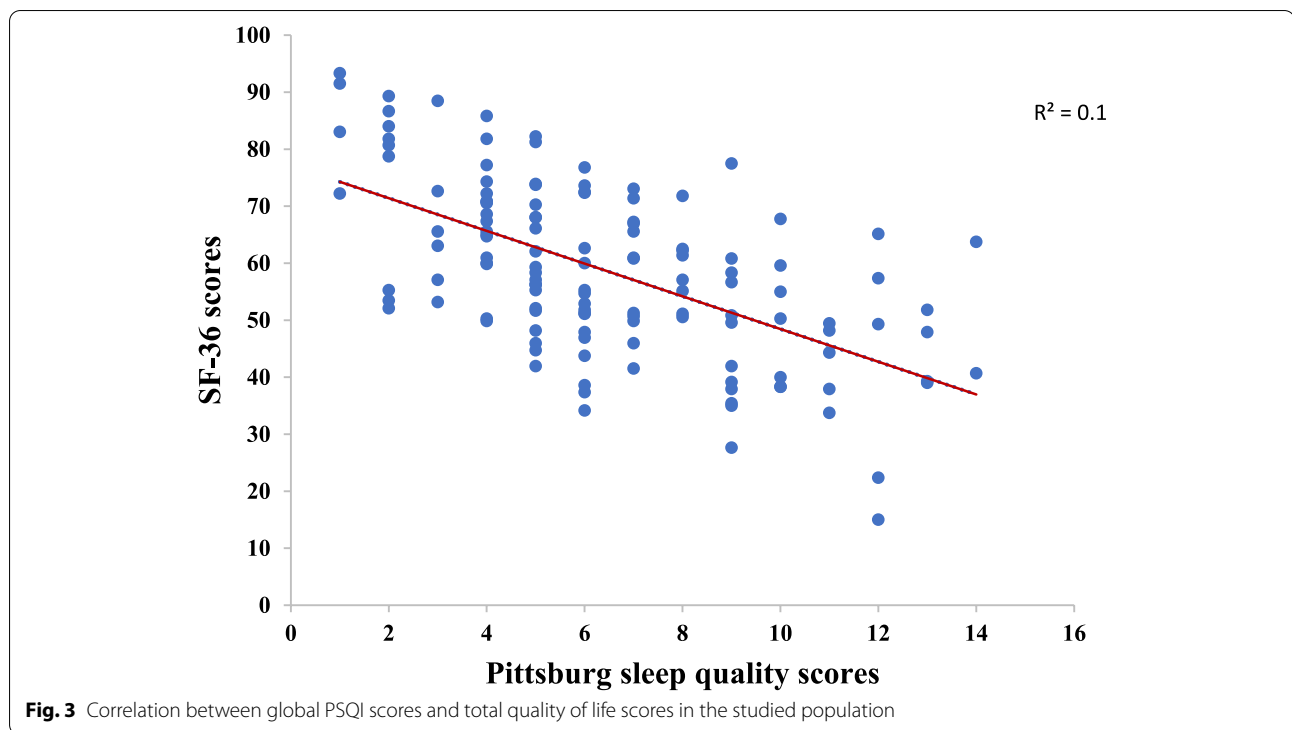
Fig. 3 Correlation between global PSQI scores and total quality of life scores in the studied population

Table 5 Correlation coefficients for the SF 36 and the PSQI among perinatal women

Variables	MCS		PCS	
	R	p	r	p
Subjective sleep quality	−0.43	<0.01	−0.41	<0.01
Sleep latency	−0.35	<0.01	−0.31	<0.01
Sleep duration	−0.19	<0.05	−0.18	<0.05
Sleep efficiency	−0.06	NS	−0.29	<0.05
Sleep disturbance	−0.39	<0.01	−0.45	<0.01
Use of sleep medications	−0.17	NS	−0.12	NS
Day time dysfunction	−0.40	<0.01	−0.37	<0.01
Global PSQI	−0.48	<0.01	−0.51	<0.01

There were significant correlations between the PCS and MCS and all the Pittsburg quality of sleep components scores except for the use of sleep medication scores. Both quality of life scores PCS and MCS had significant correlations with global PSQI score in the studied population

P value was considered significant at <0.05

MCS Mental Component Summary, *PCS* Physical Component Summary, *PSQI* Pittsburgh Sleep Quality Index

to the difference in age; women in the mentioned study were younger than the control group in this study (the mean age was 20.0 ± 3.3 years).

In the current study, the percentage of insomnia in perinatal women is in accordance with the study by Osnes et al. [32]. However, it is lower than a previous study in which 52% of perinatal women reported symptoms of insomnia (*n* = 257, participants in the mentioned study were surveyed as they sought outpatient psychiatric treatment, the presence of comorbid psychiatric conditions and the method for insomnia diagnosis might contributed to their higher rate of insomnia [45]. The current study used the DSM-5 criteria with a 3-month duration, and it incorporated daytime dysfunction as a main criterion for insomnia diagnosis. It is of note that studies using DSM-5 criteria reported lower prevalence of insomnia compared to other studies. A large Norwegian study used the DSM-5 criteria for diagnosis, reported 8.6% age-adjusted prevalence of insomnia in women. The authors explained the lower estimate of their study in comparison to earlier studies by the fact that DSM-5 insomnia diagnosis questions were based on symptoms lasting a minimum of 3 months rather than 1 month in the DSM-IV, and occurrence of symptoms for three times a week [47].

The variability in results across insomnia studies is related to the differences in the used definition of perinatal period, the criteria of insomnia diagnosis (DSM IV/V, ICD-10, or insomnia scales), the characteristics of the study population, whether the study represented pregnant women only or both pregnant and postnatal, and cultural factors including the degree of family support available for women.

In the current study, the postnatal subgroup of perinatal women showed the highest frequency of insomnia

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(36.4%) while the in the pregnant subgroup only 19.4% met the criteria for diagnosis (Fig. 1). This is in accordance with a Chinese study in which insomnia was found in 19.2% of pregnant women [49].

Another study found even a lower prevalence of 17% for clinically significant insomnia across all trimesters [29]. Moreover, a recent Australian study investigated insomnia at 28–30 and 35–36 weeks of gestation, and 1.5, 3, 6, 12, and 24 months postpartum, found proportions of women meeting insomnia criteria were 16.0% and 19.8% during early and late third trimester, and ranged 5.3–11.7% during the 5 postpartum time-points [34]. In a Spanish study of 486 women followed for the presence of insomnia before pregnancy and throughout pregnancy and 6 months postpartum, 6.1% of women reported insomnia symptoms before pregnancy which escalated to 44.2 and 46.3%, in the first and second trimester, respectively. The prevalence was 63.7% by the third trimester, and 33.2% 6 months after delivery [35].

In the current study, perinatal women had a higher mean global PSQI score than the control group; 8.02 ± 2.97 and 4.97 ± 2.45, respectively (Table 3). This indicates poor sleep quality in perinatal women. This is consistent with a meta-analysis (28 studies) that estimated pooled global PSQI in perinatal women to be 7.54 ± 0.40 [55]. However, two studies reported a much higher global scores: one of them was conducted in Menoufia, Egypt, and reported a score of 15.82±7.34 in pregnant women, but half of them were near their due date (above 37 weeks of gestational age); this may explain this high score [1], and the other is a Korean study with a score of 16.4 ± 6.3 in pregnant women and 17.5 ± 6.9 in postpartum women [22].

In the current work, all components of the PSQI—except for the use of sleep medication—were statistically different between the perinatal and the control two groups ($P < 0.05$) (Table 3). In line with this, the use of sleep medication domain was reported as the one with the lowest score in a meta-analysis of sleep quality in perinatal women. This reflects the fear among women about the consequences of medications use on their fetuses and infants during breast feeding and about the side effects they may experience in this critical time [55]. Results of the current study revealed that the perinatal group had higher scores of the other PSQI six components with the highest score in the sleep disturbance component, which probably represent the sleep fragmentation in the third trimester of pregnancy and postnatal time. Other factors that may explain this result are physical discomfort [21], progesterone levels [27], infant wake-sleep cycles, and breast feeding practices [12].

In the present study, the PSQI in the pregnant subgroup was 7.42 ± 0.51 (Fig. 2). This score was nearly the same as in other national and international research. In Egypt, Menoufia governorate, women in the second and third trimester allocated to non-pharmacological treatment for poor sleep quality had a pre-treatment scores of 7± 1.2 (no treatment), 8.1 ±1.5 (guided imagery), and 7.25± 1.4 (progressive relaxation) [6]. The mean score for sleep quality during the later stages of pregnancy was 7.33±2.11 in population from Taiwan [23]. A third study of sleep pattern in 400 Taiwanese pregnant women reported a mean PSQI score of 7.25 ± 3.43, with a gradual decline in the sleep quality as pregnancy progressed [19]. A pooled analysis of 42 studies reported a total PSQI score of 7.54 ± 0.40 in perinatal women with poor sleep quality in 54.2% in perinatal women [55].

In the current study, PSQI in the postnatal subgroup was 8.58 ± 0.53 (Fig. 2). This is higher than the score in a previous study ($n = 2830$) that reported a mean score for the PSQI of 6.3 ± 3.1, with 57.7% scoring above the cut-off value (> 5), and this finding was associated with post-partum depression [13]. This difference may be due to the great difference in sample size, sociodemographic characteristic of the studied population, easier access to sleep clinics, and other health services in Norway where the study was conducted.

Health-related quality of life provides a wider view into health status of women in their childbearing time. Sleep disturbances and poor sleep quality in perinatal period can impact women's perception of health-related quality of life [44]. In the current study, the scores of the Arabic version of SF-36 of the perinatal group were lower than control scores: 54.96 ± 14.64 versus 62.34 ± 14.63, respectively. There was a statistically significant difference between the two groups in the PCS components. The perinatal women group had a lower mean PCS score of 55.36 ± 18.46 versus 63.32 ± 17.35 in the control group (Table 4). However, the MCS component scores were not statistically different between the perinatal women and the control group (54.62 ± 17.74 versus 54.96 ± 17.60). These findings are consistent with other studies [2, 16, 25, 44, 48].

In this study, the SF-36 subscale physical functioning, role physical, and vitality were significantly lower in the perinatal women group than in the control group. The scores of bodily pains, general health, social functioning, role emotional, and mental health were not statistically significant between the two groups. The lowest scores were in the vitality followed by the role physical component (Table 4). This is consistent with findings of previous studies [8, 18, 30].

In our study, elements of sleep quality were negatively correlated with physical and mental components of HRQoL apart from the use of sleep medications (Table 5). Previous studies reported this association and

considered HRQoL an important outcome in maternal sleep research [11, 46].

On the other hand, there was a moderate negative correlation between the scores of GPSQI and total SF-36 in the studied population (Spearman correlation coefficient between the scores of the two scales was −0.377, *P* < 0.001) (Fig. 3). This is consistent with previous studies [37, 38].

Conclusions

In conclusion, insomnia and poor sleep quality are found in higher frequency in perinatal women than their counterpart control. The study also showed a significant impact of these changes on maternal HRQoL. Our results revealed a negative correlation between sleep quality and both physical and mental components of SF-36 in the study population. Postnatal women reported poor sleep quality more than pregnant women. The findings of the current study stress the need to screen perinatal women for insomnia and poor sleep quality to identify women at risk for impaired HRQoL and provide educational and supportive sleep optimization strategies. More importantly, sleep should be evaluated early in pregnancy and followed through the perinatal period to improve women sleep quality and HRQoL.

Abbreviations
DSM-5: Diagnostic and Statistical Manual of Mental Disorders; PSQI: Pittsburg Sleep Quality Index; SF-36: Health-related quality of life, 36-item Short Form; HRQoL: The health-related quality of life.

Authors' contributions
Study conception and design: NE, OI, ME, AT, and HH. Data collection: HH, NE, and NO. Data analysis and interpretation: HH, NE, and OI. Drafting of the article: NE, AT, and HH. Critical revision of the article: NE, AT, and HH. The author(s) read and approved the final manuscript.

Availability of data and materials
Available data and material.

Declarations

Ethics approval and consent to participate
The study was approved by the Ethics and Clinical Research Committee of the Faculty of Medicine, Suez Canal University, with ethical approval No. 3557; year 2018. Written informed consent was obtained from each participant. The objectives and aims of the study were clarified to the participants. The studied subjects were informed that they have the right to withdraw from the study at any time.

Consent for publication
Oral consent from the study subjects was obtained for publication.

Competing interests
The authors declare that they have no competing interests.

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