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Symptoms of Daytime Sleepiness and Sleep Apnea among Pregnant Women

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ABSTRACT

Objectives: Despite the fact that sleep disturbances have been associated with poor maternal and neonatal health outcomes in pregnancy, no studies have assessed excessive daytime sleepiness or the risk for sleep apnea among pregnant Saudi Arabian women. We sought to estimate the prevalence of excessive daytime sleepiness (EDS) and the high risk for sleep apnea (OSA) in a sample of pregnant Saudi women. ***Methods***: An anonymous self-report questionnaire was completed by 517 pregnant women who attended obstetric outpatient clinics at King Abdulaziz Medical City, Riyadh, Saudi Arabia, for a routine pregnancy check. We collected demographic and clinical data for all patients and used the Berlin Questionnaire and the Epworth Sleepiness Scale to determine the primary outcomes. ***Results:*** A high risk of OSA was found in 37.1% of women (95% confidence interval (CI): 33.00%–41.50%), and EDS was found in 32.1% (95% CI: 28.10%–36.30%). The presence of both (EDS and a high risk of OSA) was found in 14.9% of women (95% CI: 11.90%–18.30%). We found increased odds of EDS in women who reported pain three times or more per week (adjusted odds ratio (aOR) = 2.59) and insomnia (aOR = 1.65). Older women (≥ 37 years) (aOR = 3.00), those who reported pain once a week (aOR = 1.99), pain twice a week (aOR = 2.75), three times or more a week (aOR = 2.57), and insomnia (aOR = 1.95) increased the odds of high risk for OSA. ***Conclusions:*** EDS and a high risk for OSA affected a large portion of the pregnant women included in the study, primarily those who reported pain and insomnia. Our study provides important information for gynecologists to help promote healthy sleep and manage the issues arising from sleep disturbances among pregnant women as part of their daily practice.

Sleep disturbances are a common occurrence in pregnant women.[1–4] The National Sleep Foundation estimates that 78% of women experience sleep disturbances during pregnancy.[5] Sleep disturbance issues occur in response to changes in normal sleep/wake patterns. Excessive daytime sleepiness (EDS), sleep deprivation, night waking, daytime napping, insomnia, and restless leg syndrome are the most common sleep disturbances reported by pregnant women.[1–4]

EDS, a symptom of diverse disorders and causes, is a disabling condition frequently described by pregnant women. An estimated 52–65% of women are affected by EDS at some point during their pregnancy, and its prevalence is thought to increase as the pregnancy progresses.[2,3,5,6] According to the American Academy of Sleep Medicine, people with EDS are unable to stay awake and alert during major waking episodes of the day, inappropriately dozing off at times when they should be awake. This behavior repeats daily for a minimum of three months.[7] In addition, patients may report severe tiredness, fatigue, and lack of energy. EDS is a sleep disturbance known to impair daily functioning in all aspects of life (school, work, interpersonal relationships), and to negatively affect the quality of life.[8] Studies have shown that EDS in pregnancy is associated with adverse maternal and obstetric

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health outcomes.[8–10] Pregnant women with EDS and sleep apnea are more likely to develop gestational diabetes,[2,11,12] suffer from clinical depression,[13–15] postpartum depression,[5,13,16,17] and undergo a cesarean section.[8] The Epworth Sleepiness Scale (ESS), a self-reported questionnaire, is often used as an easy and reliable screening tool to assess daytime sleepiness in pregnant women.[18] Studies have identified the following factors to be significantly associated with EDS in pregnant women: age (younger vs. older women), employment status (employed vs. unemployed), number of pregnancies (first pregnancy), restless leg syndrome,[19,20] sleep-disordered breathing,[9,10] and pre-eclampsia.[21] EDS is frequently observed during all stages of pregnancy.[2] However, some studies suggest its severity increases with pregnancy advancement and is more prevalent in the third trimester.[1,22,23]

Obstructive sleep apnea (OSA) is a major cause of EDS. OSA is characterized by partial or complete upper airway collapse leading to airflow obstruction and repetitive episodes of breathing pauses and/or shallow breathing. Predominant symptoms of EDS are associated with obstructive OSA, but not all patients with OSA suffer from EDS. The gold standard for diagnosing OSA is polysomnography. However, this test is time-consuming and expensive. The Berlin Questionnaire (BQ) is a more rapid and less costly method of screening for OSA.[24] The self-reported questionnaire evaluates the symptoms of OSA and categorizes the respondent into either high- or low-risk groups for OSA.[24] Positive BQ reporting represents a high risk of OSA development.[25] The prevalence of pregnant women being in the high-risk group for OSA has been reported as 20% in one study[26] and 32.2% in another.[27] Furthermore, pregnant women who are overweight or obese may have pre-eclampsia or suffer from chronic diseases (diabetes, hypertension, and chronic inflammation) and have a significantly higher risk for OSA compared to healthy pregnant women.[3,25,28–31] OSA in pregnancy is associated with increased maternal risk of gestational diabetes and hypertension,[27,30,32,33] pre-eclampsia,[32–34] and preterm and cesarean delivery.[31,35] Furthermore, they are at higher risk of lowbirth weight, being small for gestational age, and are frequently admitted to intensive care units.[31–34]

In Saudi Arabia, to date, few studies are investigating the prevalence or correlates of EDS and OSA.[36–38] In our previously published research about EDS and OSA among the general population, we found 31.9% at high risk of OSA when using the BQ. The risk of symptomatic OSA by combining BQ and EDS using ESS was 7.8%.[39] To the best of our knowledge, no studies have assessed EDS and OSA among pregnant women in Saudi Arabia. EDS and OSA have been associated with poor maternal and neonatal health outcomes in pregnancy. Therefore, health care providers need to detect pregnant women at risk for these conditions early so that timely preventative interventions can be implemented. This is the first study to report the prevalence of OSA and EDS among pregnant women in Saudi Arabia. In addition, we hope to identify factors associated with the high risk for OSA and EDS using a validated Arabic version of the ESS and the BQ.[40,41]

METHODS

We conducted a cross-sectional study between 1 June and 1 November 2014 in the department of Obstetrics and Gynecology (OB/GYN) at King Abdulaziz Medical City, Riyadh, Saudi Arabia. King Abdullah International Medical Research Center, Riyadh gave ethical approval for the study with protocol number RC13/106. The study sample was recruited from pregnant women who attended OB/GYN outpatient clinics for routine pregnancy checkups. Every year approximately 25 000 pregnant women visit the OB/GYN outpatient clinics, and this sample is calculated based on a confidence level of 95% with a margin of error of 5%, given a minimum sample size of 380 participants. We included all Saudi women who agreed to participate in the study, and we recruited an average of five participants every day during the study period. A consecutive sampling technique was performed on pregnant women who attended other obstetrics outpatient clinics at the hospital.

The survey included four sections. The first section assessed demographic data: age, education level, and coffee and tea intake. The second section assessed clinical and sleep characteristics: trimester, history of abortion, diabetes, depression, anemia, pain (abdominal pain due to uterine contraction), sleep duration (average hours of sleep per day), and insomnia. The third section assessed daytime sleepiness as measured by the Arabic version of the ESS.[40,42] ESS is a method to measure the chances of falling asleep while engaged in eight different

activities. An ESS value of 11 is considered EDS. The fourth section assessed the high risk for sleep apnea, as measured by the Arabic version of the BQ.[41] The BQ is comprised of 10 items, including wake time, snoring behavior, fatigue, history of obesity, hypertension, and obesity (body mass index > 30). A score of 2 or more was classified as a high risk for OSA. Verbal consent for participation was obtained from all subjects included in the study. A total of 630 anonymous surveys were distributed, and 517 pregnant women consented and completed the questionnaire giving a response rate of 82.1%.

The data analysis was performed by SPSS Statistics (IBM Corp. Released 2015. IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp.). The sample characteristics were summarized by percentages [Table 1]. The overall prevalence of EDS, high risk of OSA, and both EDS and high risk of OSA were reported by percentage and 95% confidence interval (CI). We used the chi-square test to assess the associations between the sample characteristics across EDS, the high risk of OSA, and both EDS and high risk of OSA [Table 2]. After adjusting for the sample characteristics in Table 2, we used multiple logistic regression models to determine the association between the sample characteristics and the presence of EDS, high risk of OSA, and both EDS and high risk of OSA in our sample [Table 3]. *P*-values < 0.050 were considered significant.

RESULTS

A total of 517 pregnant Saudi women were included in the analysis. Of the sample, 72.3% were in the third trimester, 53.1% had university degrees, 44.8% had a history of abortion, and 6.8% had diabetes mellitus [Table 1]. The mean age of the sample studied was 30.1±5.4 years, with an age range of 17–47 years.

The overall prevalence of EDS was 32.1% (166 of 517) with 95% CI: 28.10%–36.30%. Of the pregnant women studied, 37.1% (192 of 517) had a high risk of OSA with 95% CI: 33.00%–41.50%. The presence of both (EDS and high risk of OSA) was 14.9% (77 of 517) with 95% CI: 11.90%–18.30%.

The overall prevalence of insomnia was 28.2%, while the prevalence of EDS was significantly higher in pregnant women with insomnia than in those without insomnia (41.8% vs. 28.3%, $p = 0.003$) [Table 2].

Table 1: Sample characteristics.

Characteristics	n	%
Age, years		
< 25	77	14.9
25–36	372	72.1
> 36	67	13.0
Third trimester		
No	143	27.7
Yes	374	72.3
University		
No	236	46.9
Yes	267	53.1
Coffee intake		
No	128	24.8
Yes	389	75.2
Tea intake		
No	268	51.8
Yes	249	48.2
History of abortion		
No	234	55.2
Yes	190	44.8
Diabetes mellitus		
No	482	93.2
Yes	35	6.8
Depression		
No	502	97.1
Yes	15	2.9
Anemia		
No	416	80.5
Yes	101	19.5
Bronchial asthma		
No	462	89.4
Yes	55	10.6
Sleep duration, hours		
< 7	302	60.0
7–9	154	30.6
> 9	47	9.3
Have pain per week		
None	142	27.6
Once	113	21.9
Twice	121	23.5
Three times and above	139	27.0
Insomnia		
No	371	71.8
Yes	146	28.2
EDS		
No	351	67.9
Yes	166	32.1
High risk for OSA		
No	325	62.9
Yes	192	37.1
EDS and OSA		
No	440	85.1
Yes	77	14.9

EDS: excessive daytime sleepiness; OSA: obstructive sleep apnea.

Table 2: EDS, high risk for OSA, and both EDS and high risk for OSA and their relation to the sample characteristics.

Factors	EDS					High risk for OSA					EDS and high risk for OSA				
	No		Yes			Low risk		High risk			No		Yes		
	n	%	n	%	*p*	n	%	n	%	*p*	n	%	n	%	*p*
Age, years															
< 25	49	63.6	28	36.4	0.097	54	70.1	23	29.9	0.028*	63	81.8	14	18.2	0.426
25–36	249	66.9	123	33.1		237	63.7	135	36.3		316	84.9	56	15.1	
> 36	53	79.1	14	20.9		33	49.3	34	50.7		60	89.6	7	10.4	
Third trimester															
No	99	69.2	44	30.8	0.687	96	67.1	47	32.9	0.214	127	88.8	16	11.2	0.143
Yes	252	67.4	122	32.6		229	61.2	145	38.8		313	83.7	61	16.3	
Coffee intake															
No	82	64.1	46	35.9	0.285	85	66.4	43	33.6	0.339	107	83.6	21	16.4	0.579
Yes	269	69.2	120	30.8		240	61.7	149	38.3		333	85.6	56	14.4	
Tea intake															
No	179	66.8	89	33.2	0.578	161	60.1	107	39.9	0.173	220	82.1	48	17.9	0.046*
Yes	172	69.1	77	30.9		164	65.9	85	34.1		220	88.4	29	11.6	
History of abortion															
No	162	69.2	72	30.8	0.684	152	65.0	82	35.0	0.544	205	87.6	29	12.4	0.694
Yes	135	71.1	55	28.9		118	62.1	72	37.9		164	86.3	26	13.7	
Diabetes mellitus															
No	326	67.6	156	32.4	0.643	311	64.5	171	35.5	0.004*	412	85.5	70	14.5	0.380
Yes	25	71.4	10	28.6		14	40.0	21	60.0		28	80.0	7	20.0	
Depression															
No	341	67.9	161	32.1	1.000	317	63.1	185	36.9	0.431	428	85.3	74	14.7	0.477
Yes	10	66.7	5	33.3		8	53.3	7	46.7		12	80.0	3	20.0	
Anemia															
No	282	67.8	134	32.2	0.919	261	62.7	155	37.3	0.907	355	85.3	61	14.7	0.765
Yes	69	68.3	32	31.7		64	63.4	37	36.6		85	84.2	16	15.8	
Bronchial asthma															
No	313	67.7	149	32.3	0.840	299	64.7	163	35.3	0.011*	395	85.5	67	14.5	0.469
Yes	38	69.1	17	30.9		26	47.3	29	52.7		45	81.8	10	18.2	
Sleep duration, hours															
< 7	204	67.5	98	32.5	0.925	183	60.6	119	39.4	0.590	251	83.1	51	16.9	0.427
7–9	106	68.8	48	31.2		97	63.0	57	37.0		133	86.4	21	13.6	
> 9	31	66.0	16	34.0		32	68.1	15	31.9		42	89.4	5	10.6	
Have pain per week															
None	110	77.5	32	22.5	0.001*	109	76.8	33	23.2	0.001*	129	90.8	13	9.2	0.058
Once	75	66.4	38	33.6		75	66.4	38	33.6		98	86.7	15	13.3	
Twice	86	71.1	35	28.9		63	52.1	58	47.9		100	82.6	21	17.4	
Three times and above	78	56.1	61	43.9		76	54.7	63	45.3		111	79.9	28	20.1	
Insomnia															
No	266	71.7	105	28.3	0.003*	251	67.7	120	32.3	0.001*	327	88.1	44	11.9	0.002*
Yes	85	58.2	61	41.8		74	50.7	72	49.3		113	77.4	33	22.6	

*EDS: excessive daytime sleepiness; OSA: obstructive sleep apnea. *Significant at p = 0.050.*

The prevalence of a high risk of OSA increases with age (29.9% in ≤ 24 years, 36.3% in 25–36 years, and 50.7% in ≥ 37 year olds, $p = 0.028$). The high risk of OSA was significantly higher in pregnant

Table 3: Multivariate factors associated with EDS, high risk for OSA, and EDS and high risk for OSA.

Factors	EDS				High risk for OSA				EDS and high risk for OSA			
			95% CI for OR				95% CI for OR				95% CI for OR	
	p	OR	Lower	Upper	*p*	OR	Lower	Upper	*p*	OR	Lower	Upper
Age, years												
< 25		1.00				1.00				1.00		
25–36	0.731	0.88	0.41	1.85	0.218	1.63	0.74	3.56	0.864	0.92	0.33	2.49
> 36	0.249	0.52	0.16	1.58	0.043*	3.00	1.03	8.68	0.325	0.47	0.10	2.12
Third trimester												
No		1.00				1.00				1.00		
Yes	0.656	0.89	0.52	1.50	0.905	0.97	0.57	1.62	0.776	1.11	0.53	2.31
University												
No												
Yes	0.237	0.75	0.47	1.20	0.380	1.23	0.77	1.92	0.998	1.00	0.52	1.89
Coffee intake												
No		1.00				1.00				1.00		
Yes	0.490	0.83	0.48	1.41	0.655	0.89	0.52	1.50	0.380	0.73	0.36	1.47
Tea intake												
No		1.00								1.00		
Yes	0.533	0.87	0.55	1.36	0.124	0.71	0.45	1.09	0.029*	0.50	0.26	0.93
History of abortion												
No		1.00				1.00				1.00		
Yes	0.387	0.75	0.39	1.43	0.860	0.95	0.51	1.74	0.847	1.09	0.46	2.52
Diabetes mellitus												
No		1.00				1.00				1.00		
Yes	0.904	0.94	0.34	2.56	0.034	2.71	1.08	6.81	0.290	1.89	0.58	6.12
Depression												
No		1.00				1.00				1.00		
Yes	0.902	1.08	0.32	3.63	0.753	1.21	0.37	3.93	0.641	1.40	0.33	5.80
Anemia												
No		1.00				1.00				1.00		
Yes	0.381	1.29	0.72	2.29	0.300	1.34	0.76	2.34	0.152	1.71	0.82	3.55
Bronchial asthma												
No		1.00				1.00				1.00		
Yes	0.818	0.92	0.45	1.87	0.318	1.41	0.71	2.75	0.530	1.33	0.54	3.22
Sleep duration, hours												
< 7		1.00				1.00				1.00		
7–9	0.836	1.06	0.63	1.76	0.932	1.02	0.62	1.68	0.867	0.94	0.46	1.90
> 9	0.837	1.10	0.46	2.61	0.431	1.39	0.61	3.14	0.810	0.85	0.23	3.13
Have pain per week												
None		1.00				1.00				1.00		
Once	0.150	1.64	0.83	3.20	0.041*	1.99	1.02	3.87	0.648	1.25	0.48	3.21
Twice	0.995	1.00	0.49	2.02	0.003*	2.75	1.42	5.31	0.658	1.24	0.47	3.21
Three times and above	0.003*	2.59	1.38	4.83	0.003*	2.57	1.36	4.81	0.144	1.89	0.80	4.45
Insomnia												
No		1.00				1.00				1.00		
Yes	0.049*	1.65	1.00	2.71	0.006*	1.95	1.20	3.16	0.063	1.84	0.96	3.49
Gravida	0.378	1.11	0.88	1.38	0.355	1.11	0.89	1.37	0.563	1.09	0.81	1.45
Parity	0.490	0.91	0.68	1.19	0.361	0.89	0.68	1.14	0.973	0.99	0.69	1.43

EDS: excessive daytime sleepiness; OSA: obstructive sleep apnea.
**Significant at p = 0.050.*

women with diabetes mellitus (60.0% vs. 35.5%, $p = 0.004$), bronchial asthma (52.7% vs. 35.3%, $p = 0.011$), and insomnia (49.3% vs. 32.3%, $p = 0.001$) than those without these issues. The prevalence of EDS and the high risk for OSA was significantly higher in pregnant women who did not consume tea (17.9% vs. 11.6%, $p = 0.046$) and those with insomnia (22.6% vs. 11.9%, $p = 0.002$).

Both frequent pain (abdominal pain due to contractions) (aOR = 2.59; 95% CI: 1.38–4.83) and insomnia (aOR = 1.65; 95% CI: 1.00–2.71) increased the odds of EDS [Table 3].

Older age (≥ 37 years) (aOR = 3.00; 95% CI: 1.03–8.68), pain once a week (aOR = 1.99; 95% CI: 1.02–3.87), pain twice a week (aOR = 2.75; 95% CI: 1.42–5.31), and pain three times or more a week (aOR = 2.57; 95% CI: 1.36–4.81), and insomnia (aOR = 1.95; 95% CI: 1.20–3.16) increased the odds of a high risk of OSA.

DISCUSSION

Our study investigated the important issue of EDS and the risk of OSA based on ESS and BQ, respectively, in a cohort of pregnant Saudi women attending a tertiary care facility in Riyadh, Saudi Arabia. There is sparse data in this area of research, and our study has highlighted the prevalence and likely factors associated with EDS and the risk of OSA. To date, sleep disturbances have been associated with poor pregnancy outcomes.[30,32] Our study reported a high prevalence of OSA and EDS during the pregnancy term. There is a need to establish proper management options to prevent OSA and EDS during pregnancy.

The gold standard for the diagnosis of sleep breathing disorders is polysomnography. However, it is more expensive, time-consuming, and needs more logistics when used as a screening tool in general populations. ESS and BQ are well-validated tools in identifying EDS and patients at high risk of OSA. A recent meta-analysis has shown the sensitivity and specificity of ESS (54% and 65%) and BQ (76% and 59%), respectively, for identifying the risk of OSA.[43] A study by Signal et al,[44] revealed that the prevalence of EDS in their cohort of pregnant women was 1.8-times higher than in the general population. Another study reported an EDS prevalence of 12.7% in their study cohort in middle- to low-income countries.[45] The risk of OSA in pregnant women has a prevalence of 20–32% reported in the literature.[3,25,27] In our study, almost one in three women had either EDS or the risk of OSA based on the questionnaire survey, and 14.9% have both disorders, which is similar to published studies.[2,3,5,6,26,27] However, the prevalence of OSA and EDS is much higher than the prevalence among the general Saudi population, which was 7.8%.[39] It will be useful to see, in the future, whether other countries in the region have a similarly high prevalence of OSA in the pregnant cohorts.

The important factors identified in this study that are associated with EDS and the risk of OSA are insomnia, pain-related issues, increasing age, and medical comorbidities. Sleep disturbances, including insomnia, was 28.2% in our study. This is a well-known phenomenon in pregnancy and the incidence of insomnia increases as the pregnancy advances with reported incidences of 12% to 73.5%.[46–49] Our finding of pain as a contributor to sleep fragmentation, and therefore EDS with the risk of OSA, has been recently published in a large-scale US study involving more than 2400 participants.[29] Low education level, increasing maternal age, and the number of previous abortions were also important risk factors associated with EDS and risk of OSA as factors in other studies.[2,29]

There are many limitations for our study, first, it uses a questionnaire, which may overestimate the prevalence of OSA. Second, it is a cross-sectional study with known limitations. For example, we could not measure the outcome of pregnancy among those with a high risk of OSA. Furthermore, there are many causes of EDS among pregnant women, which we did not address directly. These factors include poor sleep hygiene, medical problems, and psychosocial issues. The strength of our study is that it is a reasonably large sample and is the first study using validated tools among our population, which addresses major issues about sleep disorders among pregnant women.

CONCLUSIONS

Our study identified, for the first time in a cohort of pregnant Saudi women, the prevalence of EDS and the risk of OSA using validated tools. The results of this study would help health care professionals in looking actively for the presence of EDS and OSA in the care of these subjects. They should be diligent

in seeking the right involvement of the teams in education and identification of these symptoms in pregnant women so that the adverse effects of EDS and OSA on pregnancy can be averted.

Disclosure
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