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Research Article

Early Life Adversities are Associated with Sleep Quality During Pregnancy and the Postnatal Period: A Longitudinal Study in Tunisia

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Abstract

The objective of our study was to investigate the relationship between ELAs and sleep disturbances among pregnant women in Tunisia.

We performed a prospective study on a sample of pregnant women in Primary Healthcare Centers in Tunisia during a year. ELAs were evaluated using the Adverse Childhood Experiences-International Questionnaire. Common Mental Disorders were evaluated using an Arab version of the Self-Reporting Questionnaire. Postpartum Depression was assessed using the Edinburgh Postnatal Depression Scale. Sleep disturbances were assessed using the Pittsburgh Sleep Quality Index.

The sample included 593 women. One out of three women endorsed four adversities, including household dysfunction (58.3%), physical abuse (40.0%), community violence (40.0%), and peer violence (39.3%). Half of the participants (52.4%) were exposed women to secondhand tobacco smoke.

Our findings confirm that ELAs and secondhand smoke predict sleep disturbances during pregnancy and the postpartum period.

Keywords: Adverse Childhood Experiences; Sleep Hygiene; Pregnancy; Tobacco Smoke Pollution; Tunisia

Statement of significance

Problem or issue

Sleep disturbances could lead to adverse pregnancy outcomes. However, no studies in Tunisia or North Africa examined the relationship between exposure to early life adversities and sleep disturbances among pregnant women.

What is already known

There is an extensive body of research describing plausible mechanisms that could link early life adversities to multiple sleep disturbances. These sleep dysregulations may start during childhood and continue into later in life.

What this paper adds

Our study confirmed that early life adversities predict sleep disturbances during pregnancy and the postpartum period.

Introduction

Early Life Adversities (ELAs), defined as physical, sexual, or emotional abuse and household dysfunction during the first 18 years of life, are considered significant, worldwide problems [1]. Neurobiological and epidemiological studies show that exposure to stressors early in life induces significant brain dysfunction that affects physical and mental health and that disrupts quality of life throughout the lifespan [2]. Numerous Eastern and Western studies have established the relationship between exposure to early life stress and addictive behaviors [3], chronic health conditions [4], obesity [5,6], and sleep disturbances [1]. Furthermore, a systematic review and meta-analysis [7] has shown that people with ELAs are at high risk of physical inactivity, overweight/ obesity, diabetes, cancer, and heart and respiratory disease. They are also at risk for addictive behaviors, sexual risk behaviors, Common Mental Disorders (CMDs), and interpersonal and self-directed violence [7].

Extensive recent literature has also described a wide range of plausible mechanisms that could link ELAs to multiple sleep disturbances [1]. Because of ELAs, sleep dysregulation may begin during childhood and may continue into adulthood [8,9]. In fact, a study by Bader., *et al*. [10] confirmed that adults who have experienced severe abuse and neglect in childhood or adolescence are more likely to suffer from insomnia. Other studies have shown that serious household dysfunction, parental death or divorce, and having a mentally ill or alcoholic family member are related to many types of sleep disturbances in childhood and in adulthood [11,12].

The impact of ELAs on women during pregnancy, a period of psychological and biological changes [19], is highly relevant here. In fact, a review performed by Wosu., *et al*. [20] concluded that Childhood Sexual Abuse (CSA) is associated with depression during pregnancy as well as the postnatal period. In the same context, Sanchez., *et al*. [21] showed that the odds of PTSD were particularly elevated among pregnant women with a history of childhood physical and sexual abuse and Intimate Partner Violence (IPV).

Although researchers have examined the relationship between sleep and ELAs in the general population [1], only a few studies have examined ELAs in the context of predicting sleep quality during pregnancy. This is surprising considering the impact of [35] sleep disturbances as a risk factor for adverse pregnancy outcomes, such as gestational diabetes mellitus, gestational hypertension, cesarean section, low birth weight, and preterm delivery [32,33]. Building on the cross-sectional study by Gelaye., *et al*. [35], which examined ELAs in relation to sleep only during early pregnancy (~9 weeks gestation), a primary aim of our study was to examine ELAs in relation to sleep quality during late pregnancy (second and third trimesters) and the postnatal period. In addition, we are not aware of any studies that have examined the links between ELAs, social violence, and sleep disturbances within the Tunisian or North African context. Guided by previous research, especially research in the United States, we therefore conducted the current study to investigate the relationship between different types of ELAs, including social violence, and sleep disturbances during pregnancy among a specific population of pregnant women in Tunisia.

Methods

Study design

We performed a prospective study on a sample of pregnant women in five Primary Healthcare Centers (PHCs) in the region of Monastir (Tunisia) from September 2015 to August 2016. Enrolled women were followed during the second and the third trimesters of pregnancy and during the postnatal period. Data were collected by five midwives already working in these PHCs and according to a pre-established schedule. This study is part of a larger study evaluating early exposure to violence, sleep disturbances, substance use, IPV, and mental disorders among pregnant women.

Inclusion/Exclusion criteria

Women were eligible to participate if they were at least 18 years of age and were willing to provide written informed consent. Women were ineligible if they had a multi-fetal pregnancy, if they intended to terminate their pregnancy, or if they had known Fetal Growth Retardation (FGR).

Study instruments

Measurement of early life adversities

ELAs were evaluated using the Arab version of the Adverse Childhood Experiences-International Questionnaire (ACE-IQ) developed by WHO [23]. This version was validated in Saudi Arabia [24] and then adapted to the Tunisian context. It includes eight categories (see Table 1) of ELAs that measure intra-familial and social adversities.

	Yes		No	
	Count	Percent	Count	Percent
Household dysfunction	346	58.3%	247	41.7%
Physical Abuse	237	40.0%	356	60.0%
Emotional neglect	86	14.5%	507	85.5%
Physical neglect	65	11.0%	528	89.0%
Sexual abuse	51	8.6%	542	91.4%
Peer violence	233	39.3%	360	60.7%
Community violence	237	40.0%	356	60.0%
Collective violence	60	10.1%	533	89.9%

Table 1: Frequency and percent of endorsement per adversity.

Measurement of demographics, obstetric and clinical characteristics

A structured questionnaire designed at the Department of Community Medicine of Monastir (DCMM) was used to collect socio-demographic data (age, marital status, and personal history) and obstetrical characteristics. Current smoking and environmental tobacco smoke (ETS), alcohol abuse, illicit drug use, and risky sexual behaviors were also assessed by self-report. Regarding exposure to ETS, nonsmoking mothers were asked if they were regularly exposed to ETS, where they were exposed, and the source of the smoke (husband or other family member or/and at work). The mean number of cigarettes and hours of exposure were also estimated.

Measurement of depression during antenatal and postpartum period

CMDs, including depression and anxiety, were evaluated using an Arab version of the 20-item Self-Reporting Questionnaire (SRQ-20). This screening instrument was developed by the WHO for use in community and primary care settings, especially in developing countries, to identify symptoms indicative of anxiety or depression (probable diagnosis score > 7) [25].

Postpartum Depression (PPD) was assessed using the Edinburgh Postnatal Depression Scale (EPDS), which consists of 10 screening questions that can indicate symptoms that are common in women with depression and anxiety during the year following the birth of a child [26].

Measurement of sleep disturbances

We used the Arabic version of the Pittsburgh Sleep Quality Index (PSQI), which is a self-rated questionnaire assessing sleep quality and disturbances over a one-month time interval [27]. The PSQI has already been used in Arab nations with acceptable reliability (0.65 and 0.74) [28,29].

Data collection and reporting procedures

At each assessment visit, we collected data about depressive symptoms, tobacco, alcohol, and drug use during pregnancy. We also collected data on psychiatric medication use and pregnancy complications. Information about possible exposure to ELAs during the first 18 years of life was assessed by administrating the ACE-IQ during the first follow-up visit (the visit of the second trimester of the pregnancy).

Data analysis

The primary measures of the study were analyzed using generalized linear models, with sleep as the dependent variable and intra-familial ACE, social ACE, ETS, and interaction terms for each ACE by ETS. Covariates included age, CMD severity, depressive affect, and pregnancy term. Given the nature of the distribution of ACEs and other variables, Poisson-linked distribution regression analysis was used for model fitting and Akaike's Information Criterion examined for goodness of fit. We conducted separate models for each of the three time periods of interest: second trimester, third trimester, and postnatal period; and we present final models with and without covariates selected from the first stage of the analysis. SPSS v24 was used and we set a p-value < .05 as the criterion for significance.

Results

Description of the study sample

The sample included 593 women who were an average of 29 years old (SD = 5). Two women failed to report on sleep, but 242

reported their sleep quality once during pregnancy, 174 reported their sleep quality twice, and 175 reported their sleep quality during all three reporting periods. The average birthweight of the babies was 3179 grams (SD = 568). Table 1 shows the frequency of women endorsing each adversity type. More than one third of the women endorsed four of the adversity types, including (from most to fewer endorsements) household dysfunction (58.3%), physical abuse (40.0%), community violence (40.0%), and peer violence (39.3%). Emotional abuse, physical neglect, collective violence, and sexual abuse were less frequently endorsed, but all still occurred at rates of 8.6% (sexual abuse) to 14.5% (emotional neglect; see Table 1).

Table 2 presents sleep, post-partum depression, and CMD scores for this sample. As seen by both the severity score and the clinical estimates, about one third of the women were struggling with significant depressive affect. In addition, over half of the home environments exposed women to secondhand tobacco smoke (52.4%), and half of the women (50.9%) reported that their life was stressful.

		Count	Mean	Percent
Second trimester sleep quality[a]		593	5.34	
Third trimester sleep quality[a]		593	6.12	
Postnatal sleep quality[a]		593	6.58	
Common mental disorder[a]		593	6.63	
Post-partum depression severity[a]		593	9.99	
Post-partum depression clinical range	Below	366		66.4%
	At or above	185		33.6%
Second-hand smoke	No	282		47.6%
	Yes	311		52.4%
Subsequent miscarriages	No	409		69.7%
	Yes	178		30.3%
Stress in your life	No	291		49.1%
	Yes	302		50.9%

Table 2: Sleep, affect and second-hand smoke exposure.

[a]Higher scores reflect greater distress or dysfunction.

[b]EPDS cut off scores > 13 per Matthey., *et al*. 2006.

Adversity and secondhand smoke as predictors of sleep quality

Stress and CMDs were not significant covariates in any of the models and, therefore, were dropped from the analysis. All three models failed to demonstrate interactions between secondhand smoke exposure and adversity. The second trimester appeared to be the phase of pregnancy within which sleep was most sensitive to social ELAs. At that time, social ACE ($p < 0.001$) and secondhand smoke exposure ($p < 0.05$) were significant main effects predicting sleep quality. None of the covariates (age, pregnancy week, depressive affect) nor intra-familial ACE were significant predictors of sleep during the second trimester. Reviewing table 3 shows that social ACEs demonstrated the classic dose-response curve wherein higher social ACE exposure predicted poorer sleep. Despite the significant main effect, the contrast for secondhand smoke exposure was not significant.

In contrast, during the third trimester, intra-familial ACE ($p < 0.001$), social ACE ($p < 0.01$), and secondhand smoke exposure ($p < 0.05$) were predictors of sleep quality, but intra-familial ACE, rather than social ACE, demonstrated a stronger influence on sleep. Similar to the second trimester, despite the main effect for secondhand smoke, this effect was relatively weak and was not evident in the parameter contrasts. Pregnancy week was a significant covariate ($p < .001$), but age and depressive affect were not.

	Second Trimester					Third Trimester					Post-Natal Period				
			95% Wald CI					95% Wald CI					95% Wald CI		
Parameter	β	SE	Lower	Upper	Sig.	β	SE	Lower	Upper	Sig.	β	SE	Lower	Upper	Sig.
Intra-familial ACE = 5	0.93	0.43	0.09	1.77	0.03	1.03	0.36	0.32	1.74	0.01	0.98	0.23	0.54	1.43	0.00
Intra-familial ACE = 4	0.10	0.33	-0.54	0.74	0.76	0.62	0.19	0.24	0.99	0.00	0.51	0.13	0.26	0.76	0.00
Intra-familial ACE = 3	0.33	0.22	-0.10	0.76	0.13	0.46	0.15	0.16	0.75	0.00	0.38	0.09	0.19	0.56	0.00
Intra-familial ACE = 2	0.38	0.20	-0.02	0.78	0.06	0.47	0.14	0.20	0.75	0.00	0.28	0.09	0.11	0.46	0.00
Intra-familial ACE = 1	0.20	0.18	-0.16	0.55	0.28	0.16	0.14	-0.12	0.43	0.27	0.10	0.08	-0.06	0.27	0.22
Intra-familial ACE = 0[a]	0	.	.	.	.	0	.	.	.	.	0	.	.	.	.
Social ACE = 3	1.07	0.51	0.08	2.06	0.03	0.55	0.36	-0.15	1.25	0.12	0.02	0.26	-0.49	0.52	0.95
Social ACE = 2	0.58	0.19	0.22	0.95	0.00	0.28	0.12	0.05	0.52	0.02	0.21	0.08	0.06	0.36	0.01
Social ACE = 1	0.30	0.15	0.01	0.59	0.05	0.12	0.11	-0.10	0.33	0.28	0.03	0.07	-0.10	0.17	0.62
Social ACE = 0[a]	0	.	.	.	.	0	.	.	.	.	0	.	.	.	.
Second-hand smoke = yes	0.10	0.24	-0.37	0.56	0.69	0.09	0.17	-0.23	0.42	0.59	-0.27	0.11	-0.48	-0.06	0.01
Second-hand smoke = no[a]	0	.	.	.	.	0	.	.	.	.	0	.	.	.	.
Age	0.01	0.01	0.00	0.03	0.09	0.01	0.01	0.00	0.02	0.09	0.01	0.00	0.00	0.01	0.09
Pregnancy term in weeks	0.02	0.02	-0.02	0.07	0.31	-0.06	0.02	-0.09	-0.03	0.00	-0.04	0.01	-0.06	-0.02	0.00
Depressive affect	0.02	0.01	0.00	0.03	0.08	0.01	0.01	-0.01	0.02	0.26	0.01	0.00	0.01	0.02	0.00

Table 3: Parameter estimates for the Generalized Linear Model predicting sleep disturbance at each late phase of pregnancy.

[a]Referenc.

The postnatal period had a similar pattern of predictors to that which was observed during the third trimester, with intra-familial ACE ($p < 0.001$), social ACE ($p < 0.001$), and secondhand smoke ($p < 0.05$) again showing significant main effects. The parameter estimates shown in table 3 show increasing sleep disruption with progressively more intra-familial ACEs. As with the third trimester, only the contrast between two versus no social ACEs was significant during the postnatal period (third trimester $\beta = 0.28$, $p < 0.05$; postnatal period $\beta = .21$, $p < 0.05$). During the postnatal period, both weeks of pregnancy and depressive affect were significant covariates, but age was not.

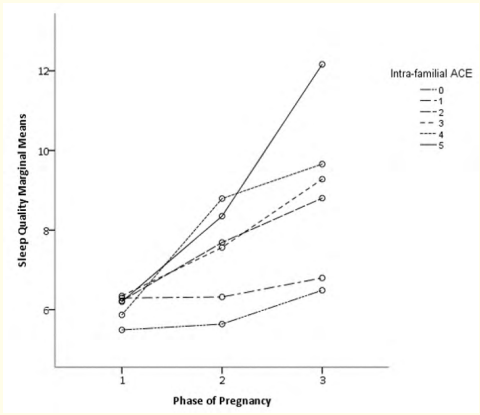

Figure 1

Discussion and Conclusion

Results of this study show that ELAs (intra-familial and social ELAs) were common among pregnant women, with the most frequent intra-familial ELAs being household dysfunction (58.3%) and physical abuse (40.0%); and the most frequent social ELAs were community violence (40.0%) and peer violence (39.3%). These results are consistent with earlier findings [30] of ELAs among pregnant women, although Soares., *et al*. [31] found a higher prevalence of ELAs among Brazilian adolescents starting during the mother's pregnancy.

We also found that ELAs predicted sleep disturbances. Specifically, the second trimester appeared to be the period of pregnancy wherein sleep was most sensitive to social ELAs, with a dose-response relationship (social ACE exposure predicted poorer sleep) observed during this period. Intra-familial ELAs were more predictive of sleep disturbances during the third trimester of pregnancy and the postpartum period, which is consistent with the conclusions drawn by Kajeepeta., *et al*. [1] in their systematic review of ELAs and sleep disturbances among adults. Our study extended work by others [35] by examining intra-familial and social ELAs in relation to sleep quality during late pregnancy (i.e., second trimester, third trimester) and the postnatal period. Consistent with earlier findings [35] for childhood physical and sexual abuse predicting poor sleep quality during early pregnancy, we found that ELAs continue to predict sleep quality during late pregnancy and the postnatal period. Moreover, our inclusion of both intra-familial and social ELAs allowed us to identify interesting differences in the relationships between these types of ELAs and sleep quality within each pregnancy period.

While depression and secondhand smoke exposure were not primary to our study, these factors predicted sleep quality during some periods of pregnancy. These findings extend and complement findings by other researchers [36]. We note that the current study is the first to examine the relationship between secondhand smoke and sleep among pregnant women in this region. Previous research had established the relationship between secondhand smoke and negative pregnancy outcomes (preterm birth, low birth weight) [37,38] as well as the relationship between secondhand smoke and sleep disturbances among children, adolescents, and adults [39-41]; however, studies on the role of secondhand smoke in sleep disturbances during pregnancy are scarce. We found that secondhand smoke predicted sleep disturbances during the second and the third trimesters of pregnancy as well as during the postnatal period.

We should note some of the limitations of the current study. A primary limitation is the self-reported nature of ELAs and sleep disturbances, which makes them subject to social desirability bias and, thus, increases our risk of underestimating the true association between ELAs and sleep quality. In addition, other potential risk factors for sleep disturbances during pregnancy, such as hormonal and physiological factors, were not assessed in this cohort. Yet, it is worth noting that a strength of this study includes the prospective nature of our design.

In conclusion, our study confirmed that ELAs and secondhand smoke predict sleep disturbances during pregnancy and the postpartum period. In light of the growing and consistent literature on the adverse impact of sleep disturbances on pregnancy [32,33], public health programs should target interventions to reduce risk factors associated with poor sleep quality, such as secondhand smoke, to improve sleep for pregnant women and during the postnatal period. In addition, public health interventions should enhance children protection from intra-familial adversities and social violence.

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