Sleep Disorders in Adults with Epilepsy: Prevalence and Self-Reported Assessment at a Tertiary Center

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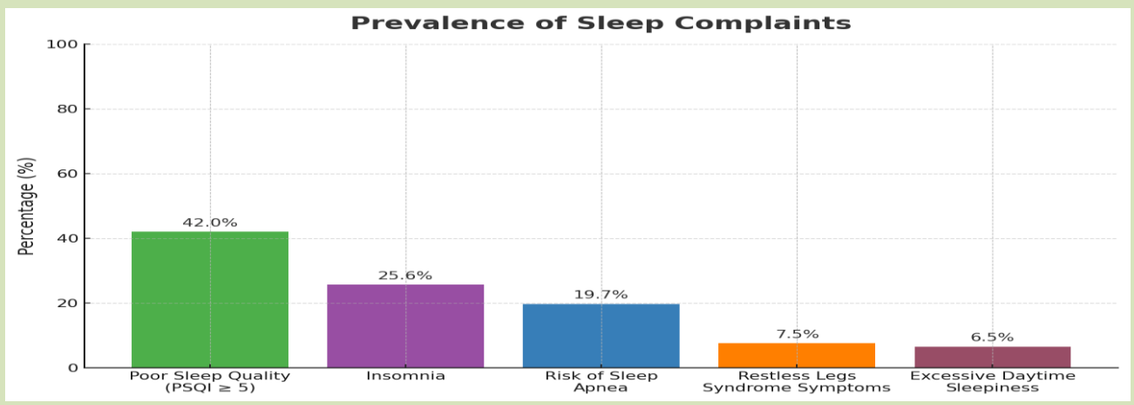
Purpose

Purpose: Sleep disorders are one of the most common comorbidity in people with epilepsy (PWE). Considering the impact of sleep-wake cycle dysregulation on seizures and on depression and anxiety, this study aimed to subjectively assess the prevalence of sleep disturbances, depression, anxiety and quality of life in PWE admitted to a tertiary epilepsy center.

Methods

PWE followed at the Neurology Unit of the Tor Vergata University Hospital in Rome were enrolled. Each participant underwent a medical examination and completed a set of questionnaires to assess:

- **sleep quality (Pittsburgh Sleep Quality Index - PSQI),**
- **insomnia (Insomnia Severity Index - ISI),**
- **risk of sleep apnea (Berlin Questionnaire),**
- **daytime sleepiness (Epworth Sleepiness Scale - ESS),**
- **restless legs syndrome (RLS - International RLS Study Group Scale),**
- **chronotype (Morningness-Eveningness Questionnaire),**
- **depression (Neurological Disorders Depression Inventory for Epilepsy),**
- **anxiety (Generalized Anxiety Disorder-7)**
- **Quality of Life in Epilepsy (Qolie-31).**



Demographic and Clinical Characteristics of the Study Sample (n=386).

Characteristic*	People with Epilepsy (n=386)	Epilepsy Type	
		Focal Epilepsy (n=337)	Generalized Epilepsy (n=46)
	Mean ± SD or n (%)	Mean ± SD or n (%)	Mean ± SD or n (%)
Sex, n. (%)			
Male	205 (53.1%)	174 (51.6%)	28 (60.9%)
Female	181 (46.9%)	163 (48.4%)	18 (39.1%)
Age (years)	50.10 ± 19.00	52.60 ± 18.20	33.10 ± 15.90
Age at epilepsy onset (years)	37.70 ± 22.70	40.90 ± 22.50	16.10 ± 9.20
Duration of epilepsy (months)	150.00 ± 181.00	142.00 ± 177.00	208.00 ± 198.00
Etiology of epilepsy, n. (%)			
Structural	153 (39.6%)	153 (45.4%)	0 (0.0%)
Genetic	9 (2.3%)	3 (0.9%)	6 (13.0%)
Infectious	4 (1.0%)	4 (1.9%)	0 (0.0%)
Metabolic	2 (0.5%)	2 (0.6%)	0 (0.0%)
Autoimmune	3 (0.8%)	3 (0.9%)	0 (0.0%)
Unknown	215 (55.7%)	172 (51.0%)	40 (87.0%)
Seizure Type, n. (%)			
Generalized	52 (13.5%)	6 (1.8%)	45 (97.8%)
Focal	331 (85.8%)	331 (98.2%)	0 (0.0%)
Focal and Generalized	3 (0.8%)	0 (0.0%)	1 (2.2%)
Seizure freedom, n. (%)			
Yes	295 (76.4%)	266 (68.7%)	41 (89.1%)
No	91 (23.6%)	71 (21.1%)	5 (10.9%)
ASM therapy, n. (%)			
Monotherapy	238 (67.2%)	211 (68.7%)	26 (57.8%)
Polytherapy	108 (30.5%)	90 (29.3%)	17 (37.8%)
Not in treatment	8 (2.3%)	6 (2.0%)	2 (4.4%)
ASM Daily Dose (DDD)	1.16 ± 0.93	1,17 ± 0.97	1,07 ± 0.81

* 3 (0.8%) patients with the type of epilepsy is unknown.

Comparisons between Structural and Unknown Etiology

	Epilepsy Eziology				ANCOVA*
	Structured (n=153)		Unknown (n=215)		
	Mean	SD	Mean	SD	
PSQI Global	5,57	3,67	5,40	3,59	F(1,365)=0.02; p=0.886
C1. Sleep Quality	1,05	0,74	0,98	0,68	F(1,365)=0.40; p=0.530
C2. Sleep Latency	0,71	0,99	0,85	1,03	F(1,365)=1.29; p=0.258
C3. Sleep Duration	1,05	1,03	0,94	0,94	F(1,365)=0.33; p=0.566
C4. Sleep Efficiency	1,04	1,15	0,84	1,09	F(1,365)=1.55; p=0.215
C5. Sleep Disturbances	1,01	0,55	1,07	0,62	F(1,365)=1.67; p=0.197
C6. Sleep Medication	0,27	0,84	0,30	0,87	F(1,365)=0.25; p=0.614
C7. Daytime Dysfunction	0,56	0,77	0,45	0,72	F(1,365)=1.65; p=0.200
ESS	3,97	3,23	4,55	3,48	F(1,365)=3.34; p=0.068
ISI	5,45	5,11	5,03	4,83	F(1,365)=0.35; p=0.557
IRLS	0,99	4,19	1,40	4,71	F(1,365)=1.40; p=0.237
Apnea Risk, n. (%)	30	19,60%	44	20,80%	$\chi^2(1)=0.07$; p=0.788
MEQ	58,20	8,88	56,40	9,64	F(1,364)=0.64; p=0.424
GAD-7	5,24	4,48	5,10	4,24	F(1,365)=0.14; p=0.705
NDDI-E	9,43	3,26	9,96	3,85	F(1,365)=1.85; p=0.175
QoL31 Seizure Worry	74,90	26,90	80,50	22,80	**F(1,365)=4.56; p=0.033**
QoL31 Overall QoL	64,00	18,40	67,00	18,80	F(1,365)=1.50; p=0.222
QoL31 Emotional Well-being	60,40	16,90	63,80	18,70	F(1,365)=2.59; p=0.109
QoL31 Energy/Fatigue	52,30	19,80	55,80	20,60	F(1,365)=1.84; p=0.176
QoL31 Cognitive Functioning	74,60	25,50	78,70	24,70	F(1,365)=1.37; p=0.242
QoL31 Medication Effects	81,20	22,30	84,00	22,20	F(1,365)=1.62; p=0.204
QoL31 Social Function	76,20	26,00	85,30	21,90	**F(1,365)=10.91; p=0.001**
QoL31 Overall Score	69,10	16,10	73,40	15,80	**F(1,365)=4.97; p=0.026**

Comparisons between Focal and Generalized Epilepsy

	Epilepsy Type				ANCOVA*
	Generalized (n=46)		Focal (n=337)		
	Mean	SD	Mean	SD	
PSQI Global	5,67	3,11	5,40	3,64	F(1,377)=0.25; p=0.782
C1. Sleep Quality	1,11	0,71	1,00	0,70	F(1,377)=2.46; p=0.118
C2. Sleep Latency	1,20	1,13	0,72	0,98	**F(1,377)=5.78; p=0.017**
C3. Sleep Duration	0,87	0,93	0,99	0,98	F(1,377)=0.01; p=0.916
C4. Sleep Efficiency	0,76	1,08	0,94	1,12	F(1,377)=0.05; p=0.824
C5. Sleep Disturbances	1,07	0,71	1,04	0,57	F(1,377)=1.85; p=0.174
C6. Sleep Medication	0,17	0,61	0,29	0,87	F(1,377)=0.17; p=0.682
C7. Daytime Dysfunction	0,50	0,69	0,49	0,74	F(1,377)=0.19; p=0.667
ESS	5,39	4,20	4,23	3,28	**F(1,377)=6.66; p=0.010**
ISI	6,52	5,21	5,03	4,81	**F(1,377)=5.37; p=0.021**
IRLS	0,70	3,46	1,25	4,53	F(1,377)=0.01; p=0.906
Apnea Risk, n. (%)	8	17,40%	67	20,10%	$\chi^2(1)=0.18$; p=0.670
MEQ	50,80	9,27	58,00	9,00	**F(1,376)=6.44; p=0.012**
GAD-7	5,46	4,08	5,09	4,30	F(1,377)=0.01; p=0.912
NDDI-E	10,50	3,64	9,67	3,57	F(1,377)=0.86; p=0.353
QoL31 Seizure Worry	79,40	25,10	78,20	24,80	F(1,377)=0.33; p=0.567
QoL31 Overall QoL	67,30	16,30	65,70	18,70	F(1,377)=0.01; p=0.933
QoL31 Emotional Well-being	64,40	16,30	61,90	17,80	F(1,377)=0.32; p=0.573
QoL31 Energy/Fatigue	56,00	17,80	53,60	20,30	F(1,377)=0.07; p=0.790
QoL31 Cognitive Functioning	83,20	21,90	75,80	25,10	F(1,377)=1.32; p=0.251
QoL31 Medication Effects	83,00	21,00	82,80	22,30	F(1,377)=0.00; p=0.997
QoL31 Social Function	85,20	21,40	80,90	24,40	F(1,377)=0.17; p=0.679
QoL31 Overall Score	74,20	13,10	71,10	16,10	F(1,377)=0.32; p=0.572

*Age, sex, number of seizures and DDD as covariates

Comparisons between Monotherapy and Polytherapy

	Therapy				ANCOVA*
	Monotherapy (n=260)		Polytherapy (n=117)		
	Mean	SD	Mean	SD	
PSQI Global	5,56	3,54	5,03	3,63	F(1,371)=1.52; p=0.219
C1. Sleep Quality	1,04	0,72	0,92	0,66	F(1,371)=3.10; p=0.079
C2. Sleep Latency	0,74	0,98	0,77	1,05	F(1,371)=0.08; p=0.778
C3. Sleep Duration	1,05	0,99	0,80	0,94	**F(1,371)=6.41; p=0.012**
C4. Sleep Efficiency	0,96	1,13	0,81	1,08	F(1,371)=1.82; p=0.178
C5. Sleep Disturbances	1,07	0,57	0,97	0,57	F(1,371)=2.30; p=0.130
C6. Sleep Medication	0,25	0,82	0,37	0,94	F(1,371)=1.32; p=0.251
C7. Daytime Dysfunction	0,48	0,73	0,51	0,75	F(1,371)=0.15; p=0.699
ESS	4,30	3,17	4,44	3,91	F(1,371)=0.19; p=0.667
ISI	5,13	4,85	5,02	4,63	F(1,371)=0.05; p=0.822
IRLS	1,34	4,66	0,58	3,15	F(1,371)=2.44; p=0.119
Apnea Risk, n. (%)	50	19,40%	23	19,80%	$\chi^2(1)=0.01$; p=0.920
MEQ	57,40	8,89	57,10	9,92	F(1,370)=0.00; p=0.998
GAD-7	5,00	4,34	5,28	4,10	F(1,371)=0.50; p=0.480
NDDI-E	9,55	3,53	10,20	3,73	F(1,371)=2.10; p=0.148
QoL31 Seizure Worry	80,70	22,90	73,90	27,80	**F(1,371)=5.00; p=0.026**
QoL31 Overall QoL	67,20	18,10	63,30	19,20	F(1,371)=2.73; p=0.100
QoL31 Emotional Well-being	63,50	17,70	59,20	17,50	**F(1,371)=5.86; p=0.016**
QoL31 Energy/Fatigue	54,80	20,30	52,80	20,30	F(1,371)=0.99; p=0.320
QoL31 Cognitive Functioning	78,80	24,60	73,50	24,40	F(1,371)=3.58; p=0.059
QoL31 Medication Effects	85,30	19,90	76,70	24,90	**F(1,371)=12.40; p<0.001**
QoL31 Social Function	84,50	22,70	75,10	25,70	**F(1,371)=9.65; p=0.002**
QoL31 Overall Score	73,50	15,30	67,70	16,60	**F(1,371)=10.35; p=0.001**

*Age, sex, number of seizures and DDD as covariates
NOTE: Not in treatment (n=9)

Comparisons between Persistent Seizures and Seizure Freedom

	Seizure Freedom				ANCOVA*
	Yes (n=310)		No (n=76)		
	Mean	SD	Mean	SD	
PSQI Global	5,44	3,61	5,30	3,44	F(1,381)=0.08; p=0.783
C1. Sleep Quality	1,01	0,72	1,00	0,63	F(1,381)=0.03; p=0.871
C2. Sleep Latency	0,76	1,00	0,82	1,05	F(1,380)=0.16; p=0.689
C3. Sleep Duration	0,97	0,98	0,94	0,97	F(1,381)=0.11; p=0.740
C4. Sleep Efficiency	0,89	1,10	1,00	1,17	F(1,381)=0.31; p=0.579
C5. Sleep Disturbances	1,06	0,59	0,96	0,58	F(1,381)=2.00; p=0.158
C6. Sleep Medication	0,29	0,86	0,24	0,81	F(1,381)=0.22; p=0.638
C7. Daytime Dysfunction	0,49	0,72	0,47	0,77	F(1,381)=0.07; p=0.797
ESS	4,42	3,47	4,09	3,15	F(1,381)=0.73; p=0.395
ISI	5,35	5,05	4,43	4,05	F(1,381)=2.65; p=0.104
IRLS	1,20	4,44	1,08	4,25	F(1,381)=0.06; p=0.813
Apnea Risk, n. (%)	60	19,50%	15	19,70%	$\chi^2(1)=0.001$; p=0.970
MEQ	57,40	9,22	56,10	9,70	F(1,380)=1.40; p=0.238
GAD-7	5,09	4,31	5,30	4,23	F(1,381)=0.11; p=0.744
NDDI-E	9,68	3,51	10,10	3,88	F(1,381)=0.52; p=0.470
QoL31 Seizure Worry	80,60	23,80	69,60	26,70	**F(1,381)=11.13; p<0.001**
QoL31 Overall QoL	67,20	18,30	61,00	18,00	**F(1,381)=6.82; p=0.009**
QoL31 Emotional Well-being	62,70	17,40	60,30	19,10	F(1,381)=1.10; p=0.294
QoL31 Energy/Fatigue	54,10	20,00	54,30	21,10	F(1,381)=0.04; p=0.851
QoL31 Cognitive Functioning	77,30	25,10	75,00	23,70	F(1,381)=0.42; p=0.518
QoL31 Medication Effects	83,20	22,50	81,10	20,70	F(1,381)=0.60; p=0.438
QoL31 Social Function	83,50	23,10	73,10	26,00	**F(1,381)=10.18; p=0.002**
QoL31 Overall Score	72,60	15,80	67,50	15,60	F(1,380)=3.04; p=0.082

*Age, sex, and DDD as covariates

After adjusting for age, sex, seizure frequency, and antiseizure medications defined daily dose, ANCOVA showed that etiology of epilepsy was significantly associated with seizure worry and social functioning subscales of QoL31, with trends observed for overall quality of life and daytime sleepiness. Several covariates demonstrated significant associations across multiple domains. Specifically, sex was associated with higher anxiety (GAD-7), depressive symptoms (NDDI-E), and poorer scores in several QoL31 subscales (emotional, energy, and social functioning). Seizure frequency in the last 28 days was associated higher seizure worry and lower overall QoL, while higher DDD was linked to poorer medication- and cognition-related QoL scores. Age was significantly related to chronotype (MEQ) and aspects of sleep quality.

Conclusion

This study highlights the high prevalence of sleep disturbances in PWE and emphasizes the importance of appropriate screening tools to facilitate the identification and management of sleep disorders, considering the detrimental effects of the sleep-wake cycle dysregulation on seizure recurrence, poor compliance treatment, neuropsychiatric symptoms and reduced quality of life.