



## Abstracts of free works of the I International Congress of Sleeping Medicine

### Resúmenes de trabajos libres del I Congreso Internacional de Medicina del Dormir

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### Effect of sleep recovery on memory in fruit flies *Drosophila melanogaster* subjected to sleep deprivation<sup>+</sup>

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<sup>+</sup>Winning abstract in the basic/translational research category.

**Introduction:** sleep is considered a vital and complex phenomenon. There is research that studies the role that sleep plays in learning and memory processes. Studies in the fruit fly, *Drosophila melanogaster*, have shown how lack of sleep affects the acquisition and consolidation of information. However, as far as memory is concerned, it is currently under investigation. **Objective:** to analyze the effect of sleep recovery on memory in *Drosophila melanogaster* by means of a learning task. **Material and methods:** 100 flies of the *Drosophila melanogaster* species of the wild type strain were used; they were divided into two groups: control group (50), and experimental group (50), both groups were submitted to the same learning protocol. Flies were trained individually for six consecutive days, and consisted of food localization using green and red visual cues. At the end of the training days, the experimental group was subjected to sleep deprivation for six hours by mechanical stimulation with the aid of a rotating arm in the second half of the night. On the night of the seventh and eighth days, the gnats slept freely, and on the ninth day they again performed the behavioral test in order to record hits and misses. **Results:** the flies subjected to sleep deprivation initially made significant errors in performing the learned task. However, after the sleep recovery period, a decrease in the error rate was observed, as well as an increase in the hit rate, suggesting a recovery of memory processes. However, the values do not return to the values previously recorded before sleep deprivation, but there is a difference compared to the first day of learning. **Conclusion:** sleep is actively involved in the

processes of information consolidation and retrieval in *Drosophila melanogaster*.

### Sleep disturbance and symptoms of chronic fatigue in patients with a history of severe COVID-19 infection<sup>++</sup>

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<sup>++</sup>Winning abstract in the category social-economic impact research.

**Introduction:** a wide range of symptoms have been reported in individuals with a history of COVID-19 infection such as insomnia, OSAHS daytime sleepiness and chronic fatigue. **Objective:** to describe and compare sleep disturbances and chronic fatigue in patients with a history of hospitalization for severe COVID-19. **Material and methods:** design: comparative, impact, cross-sectional and projective study. Population: adults of both sexes with a history of hospitalization for COVID-19. Subjects: 50. Variables: age, sex, days of hospital stay, endotracheal intubation, insomnia, daytime sleepiness, OSAHS, chronic fatigue. **Results:** the age of the patients was  $52.8 \pm 15.7$  years, 56% women. The frequency of insomnia, daytime sleepiness and OSAS was 92, 28 and 35%, respectively. The mean score on the chronic fatigue scale of  $22.8 \pm 4.7$  points. Age > 54 years was associated with greater severity of insomnia ( $p = 0.05$ ) and endotracheal intubation with greater suspicion of OSAS ( $p = 0.02$ ). Prolonged hospital stay contributed to a higher score in the assessment of chronic fatigue and insomnia severity ( $p < 0.001$ ). **Conclusions:** a higher frequency of sleep disturbances was reported compared to patients without a history of severe COVID-19 infection. Age, prolonged hospital stay and endotracheal intubation played an important role in the presentation of sleep disturbances and chronic fatigue.

### Perinatal factors associated with infantile central apnea-hypopnea syndrome<sup>+++</sup>

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<sup>+++</sup>Winning abstract in the clinical research category.

**Introduction:** infantile central apnea-hypopnea syndrome (CAHS) considers infants  $\geq 37$  weeks of gestation; the reported frequency is 0.5 to 5.4%; its presence is a risk factor for neurodevelopmental alterations. There are several biological and environmental risk factors associated with the presence of central component respiratory events. **Objective:** to describe perinatal factors associated with the presence of infant central component apnea in infants referred by the *Hospital General de México* to the *Clínica de Trastornos del Sueño-UNAM* (CTS-UNAM). **Material and methods:** observational, cross-sectional, descriptive, retrospective study registered at the Ethics Committee of the General Hospital of Mexico: a sample of 41 CTS-UNAM files with informed consent was analyzed. Variables: childhood central apnea and perinatal factors. Inclusion criteria: patients from one to 23 months of age (term newborns), with a diagnosis of infantile central apnea by nap type polysomnography, with an average age at registration of six months in a follow-up and early intervention program for SAHCl. Descriptive statistics were performed, with mean and standard deviation for quantitative variables; percentages and frequencies for categorical variables. **Results:** 46.3% female; mean age of six months, with abnormal neurological examination in 34.1% of the cases and intrapartum complications and gastroesophageal reflux disease in 36.6% each. The degree of severity of

SAHCl was recorded as severe (53.7%), moderate (31.7%) and mild (14.6%). **Conclusions:** the perinatal risk factors most frequently associated with SAHCl were: intrapartum complications, gastroesophageal reflux and abnormal neurological examination. SAHCl is diagnosed late and with considerable intensity in 85% of cases. Prospective studies of neurodevelopmental follow-up and polysomnography in the infant population at low and high risk of developmental abnormalities are required.

### Evaluation of the relationship between peripheral temperature and electroencephalographic activity during sleep

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**Introduction:** peripheral temperature (Tp) presents a circadian rhythm that is synchronized with the wake-sleep cycle. The circadian phase of greatest heat loss coincides with the presence of sleep; moreover, Tp presents differences between NREM and REM sleep. As the spectral power density (SPD) of the electroencephalogram (EEG) in NREM and REM sleep varies circadian, a direct contribution of temperature to this variation has been proposed. **Objective:** to evaluate the relationship between Tp and EEG PED during NREM and REM sleep. **Material and methods:** 15 healthy volunteers (eight women) aged  $24.7 \pm 4.3$  years participated. Two PSG recordings were performed on consecutive nights. The first was an adaptation recording. Tp was recorded using iButton DS192H thermosensors placed on the anterior of the right and left wrists. Tp was obtained from the average of the temperatures of both wrists. With the fast Fourier transform, the PED of the delta, theta, alpha and beta bands of EEG leads C4 and C3 were calculated. The relationship between Tp and DPE was analyzed by Spearman correlations in NREM (N2 and N3 phases) and REM sleep. **Results:** only in the theta-C4 band of NREM sleep was there a significant negative correlation ( $\rho = -0.6$ ) between Tp and DPE. **Conclusions:** in REM sleep there

was no relationship between Tp and DPE and in NREM sleep there was a moderate relationship only in one band. Thus, Tp would be independent of EEG DPE, which is consistent with previous studies showing that temperature is not a determining factor in the circadian variation of EEG DPE.

### Chronic rapid eye movement sleep deprivation and restriction of rapid eye movement sleep reduces memory and learning in Wistar rats

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**Introduction:** the sleep-wake cycle is a fundamental physiological process for humans and various animal species, as it regulates metabolic, immunological and cognitive processes, among others. Some studies have shown that sleep is involved in the consolidation and retrieval of certain types of memory. However, the differential effect of selective REM sleep deprivation (PSMOR), chronic REM sleep restriction (RSMOR) and the recovery period on declarative memory is still largely unknown. **Objective:** to evaluate the effect of PSMOR and RSMOR on learning and episodic memory, as well as during the recovery period of PSMOR through the novel object recognition test (NOR test). **Material and methods:** 20 male Wistar rats were used and randomly placed in the following groups ( $n = 6$ ) 1. control, 2. PSMOR  $\times$  72 hours, 3. PSMOR  $\times$  72 hours + eight days of recovery, 4. RSMOR  $\times$  11 days. PSMOR and RSMOR were performed using the multi-platform technique. After the sleep deprivation, restriction and recovery periods, the animals were evaluated with the behavioral NOR test. **Results:** sleep deficit produced a decrease in NOR test performance. The PSMOR  $\times$  72-hour condition caused the greatest alterations affecting performance on the NOR task, and the animals' eight-day sleep recovery was insufficient to adequately restore the adverse effects of the sleep loss generated by PSMOR. **Conclusions:** we suggest that differential sleep loss has an impact on correct learning and produces deficits in declarative memory.

## Symptoms of insomnia, sleepiness and sleep quality in Mexico City merchants

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**Introduction:** sleep disorders represent a worldwide public health problem that affects the functioning of people who suffer from them and increases the risk of developing physical and mental health problems as well as the risk of suffering occupational accidents. Street vendors are a vulnerable population in Mexico because they do not have health systems that allow adequate follow-up. **Objectives:** to determine the frequency of insomnia symptoms, sleepiness and sleep quality in street vendors in Mexico City. **Material and methods:** a cross-sectional descriptive study was carried out that included 310 merchants in the northern area of Mexico City. Participants answered the insomnia severity index (ISI), Pittsburgh sleep quality index (PSQI) and Epworth sleepiness scale. **Results:** the participants were 224 (72.3%) women and 86 (27.7%) men in an age range of 16 to 77 years ( $34.4 \pm 11.75$ ). It was observed that, according to the ISI, 27.7% presented absence of insomnia, while 42.3% presented subclinical insomnia, 28.4% moderate clinical insomnia and only 1.6% severe clinical insomnia; while in the ESE, 77.1% presented normal somnolence, 9.4% marginal somnolence and 13.5% excessive somnolence; finally, the PSQI showed that 55.5% presented good sleep quality, which contrasted with 44.5% who presented poor sleep quality. **Conclusions:** most of the traders did not present scores that would allow determining that there is a sleep disorder; however, the data shows a high predisposition to develop them due to the poor quality of sleep and the level of insomnia obtained in the tests.

## Association of fear of COVID-19 and sleep quality in adults

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**Introduction:** COVID-19 emerged at the end of 2019 as a new pathogen that rapidly became a leading cause of morbidity and mortality. In this context, it was expected that individually, increased stress, as well as anxiety, depressive and sleep disorders would be perceived. **Objective:** to determine if there is an association between fear of COVID-19 and decreased sleep quality in a sample of Mexican adults. **Material and methods:** an online survey was applied that included sociodemographic data, Pittsburgh sleep quality index (PSQI) and the fear of COVID-19 scale (FCV-19S). Sleep quality was compared between genders and a bivariate correlation was performed considering: age, gender, history of mental health and substance use disorder, and PSQI and FCV-19S scores. A  $p < 0.05$  was considered significant. **Results:** 502 surveys were evaluated (78% women). Women obtained higher scores on both the PSQI ( $8.3 \pm 3.5$  versus  $6.9 \pm 3.2$ ,  $t = -3.8$ ,  $p < 0.001$ ), and the FCV-19S ( $17.3 \pm 6$  versus  $14.6 \pm 5.5$ ,  $t = -4.4$ ,  $p < 0.001$ ). Most of the subjects evaluated reported decreased quality (women 83%, men 78%,  $\chi^2 = 1.8$ ,  $p = 0.1$ ). PSQI score correlated significantly with gender ( $r = 0.17$ ), FCV-19S score ( $r = 0.31$ ) and history of mental health disorder ( $r = 0.22$ ) or substance use ( $r = 0.1$ ). **Conclusions:** sleep disturbance is highly frequent in the Mexican population and, in addition, it was related to fear of COVID, mental health disorders and substance use. In the context of the pandemic, it is even more important to explore and diagnose sleep disorders.

## Sleep quality and quality of life in Mexican adolescents

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**Introduction:** sleep disorders are relevant because they increase the risk of suffering psychiatric diseases at any time of life. In adolescence, sleep disorders and poor sleep quality are associated with the development of comorbidities that affect the normal development of those who suffer from them and have consequences in adulthood. **Objective:** to establish the association between quality of life and

sleep quality in a sample of adolescents. **Material and methods:** anthropometry and determination of body mass index (BMI) Z-score were performed in a population of high school students, the Pittsburgh quality of sleep index (PQSI) and the quality of life questionnaire (SF-36) were applied. From the sleep rating, the information was grouped and comparisons were made with Student's t-test; and finally, a correlation was performed. A  $p < 0.05$  was considered significant. **Results:** 125 adolescents were evaluated, 37 (30%) reported poor sleep quality. No statistically significant associations were found between PSQI and weight, gender and BMI. In 6/8 dimensions of the SF-36 the group with decreased sleep quality obtained lower scores. We found statistically significant correlations between poor sleep quality and physical function ( $r = -0.2$ ), physical role ( $r = -0.3$ ), emotional role ( $r = -0.3$ ), vitality ( $r = -0.4$ ), mental health ( $r = -0.4$ ), bodily pain ( $r = -0.3$ ) and general health ( $r = -0.3$ ). **Conclusions:** a close association was observed between poor sleep quality and decreased quality of life. Although other psychiatric symptoms were not evaluated, alterations in quality of life could indicate an environment that facilitates its development. Poor sleep quality is associated with decreased quality of life in a group of adolescents.

## Sleep disturbances and depression in children during quarantine by COVID-19

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**Introduction:** pandemic conditions of confinement associated with COVID-19 have affected children, who have been prone to develop sleep and mood disorders (anxiety and depression). **Objective:** to detect sleep disturbances and depression by means of instruments designed for children. **Material and methods:** the questionnaires sleep disturbances in school children (EASE) and childhood depression



(CDI) were applied to children between 6 and 12 years of age, who were contacted via internet by the acceptance of informed consent from their parents and assent from the children. Groups with and without depression were compared according to the CDI score and tests of association and risk (odds ratio [OR]) were performed with the  $\chi^2$  test with alpha significance less than 0.05. **Results:** 240 children aged  $9.93 \pm 1.8$  years (111, 46.3% girls) who answered the CDI participated and two groups were formed, with depression 136 (56.7%) and without depression 104 (43.3%). There was an association with the EASE dimensions and positive for depression and the risk of presenting a sleep disturbance given having depression (OR), difficulty falling asleep 59.6%  $p = 0.0001$ , OR = 3.4; nightmares 24%,  $p = 0.0001$ , OR = 8.17, nocturnal awakenings, not significant  $p = 0.104$ ; daytime sleepiness 9.6%,  $p = 0.012$ , OR = 4.35; tiredness and difficulty waking up, 47.1%,  $p = 0.0001$ , OR = 5.34 and sleepwalking, not significant  $p = 0.65$ . **Conclusions:** the pandemic conditions have affected the mood of children; 43% presents depression, which have been positively associated with sleep disorders with greater risk to fall asleep, nightmares, daytime sleepiness and tiredness with difficulties to wake up.

### Sleep disturbances and neuropsychiatric manifestations in patients recovered from COVID-19 and their relatives

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**Introduction:** almost two years after the declaration of the COVID-19 pandemic, the specialized literature for the acute respiratory management of this entity is extensive. However, despite the similarities between SARS-CoV-2 and other coronaviruses, The lack of knowledge of the pathophysiology and its interaction with the environment makes its sequelae unpredictable. Considering the high prevalence of neuropsychiatric symptoms

in the recovered and general population, early identification of these symptoms would allow limiting the impact of the still unpublished chronic effects of this virus on quality of life and functionality. **Objective:** to compare the severity of insomnia and depression symptoms among people recovered from COVID-19 and their relatives during two moments of the pandemic. **Material and methods:** the insomnia severity index and the patient health questionnaire were applied to persons recovered from COVID-19 in a period of less than three months, as well as to family members. They were sent and answered electronically between September 2020 and November 2021. A multivariate analysis was performed between the scores of both instruments as an independent measure with intergroup factors, differences between waves and history of COVID-19. **Results:** a total of 318 participants (first wave,  $n = 175$ ) were divided into COVID ( $n = 185$ ) and non-COVID ( $n = 133$ ) groups. Overall means of 11.54 were obtained for the PHQ-9 (COVID,  $M = 12.81$ ; non-COVID,  $M = 9.78$ ) and 12.30 for the ISI (COVID,  $M = 13.67$ ; non-COVID,  $M = 10.38$ ). Positive associations were found between wave type and ISI score ( $s = 0.003$ ), between wave type and PHQ-9 score ( $s = 0.0015$ ), and between group type and PHQ-9 score ( $s = 0.003$ ). **Conclusions:** an increase in insomnia and depression symptoms was observed in participants during the third wave compared to the first wave and was associated with having undergone COVID-19.

### Impact of prolonged respiratory events on obstructive sleep apnea

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**Introduction:** it has been considered that the apnea hypopnea index (AHI) should not be the only parameter to evaluate the severity of obstructive sleep apnea. In this study we evaluate the impact of presenting prolonged events. **Objective:** to compare differences between variables of patients

with events shorter and longer than 20 seconds. **Material and methods:** cross-sectional, analytical, where patients with  $AHI > 30/h$  were included by means of respiratory polygraphy (PR) scored manually, counting the total number of events and calculating measures of central tendency. Patients were grouped into two groups according to the average duration of total events (less than and greater than 20 seconds). Statistical analysis was performed in STATA v9.2. **Results:** 37 patients were included, 56.76% men, with mean age of 51 years, mean BMI (body mass index) of  $41.68 \text{ kg/m}^2$  and AHI of 77/h, with no difference between groups. The group with events greater than 20 seconds had higher  $\text{PaCO}_2$  (40.5 versus 35.1 mmHg), more obstructive apneas (431 versus 242), fewer hypopneas (133 versus 311), lower average saturation (81 versus 86%), more time saturating below 80% (39 versus 16%) and the drop in saturation on watch was calculated to the average in the PR and was higher in patients with prolonged events (10.7 versus 7%); all with a  $p < 0.05$ . There were no differences in demographic variables, comorbidities, spirometry and chest radiography. **Conclusions:** despite presenting the same AHI, patients with prolonged events have a greater impact on oxygenation and ventilation.

### First acute myocardial infarction and its association with sleep apnea: preliminary analysis

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**Introduction:** sleep is a vital state associated with the maintenance of health. The most common sleep breathing disorder is sleep apnea (SA). The obstructive form (OSA) affects nearly 1 billion adults worldwide. It has been documented that OSA can induce intermittent hypoxemia, sympathetic stimulation, intrathoracic pressure changes, and inflammatory disorders; these mechanisms are related to the onset and progression of cardiovascular disease.

**Objective:** to evaluate the prevalence, severity and association of SA and first acute myocardial infarction (AMI). **Material and methods:** 24 patients with AMI were evaluated: cardiac markers, sleep quality, degree of daytime sleepiness, severity of apnea and level of nocturnal hypoxemia. Apnea was classified into two groups: no apnea and mild AS (up to 14.9 ev/h) and moderate and severe AS (> 15 ev/h). **Results:** 70.8% of patients sleep < 7 h/night, 46% presented abnormal sleepiness. Of the 24 patients, 13 had no or mild AS (mean = 8.1) and 11 had moderate or severe AS (mean = 27.5) ( $p = 0.0001$ ). Troponin (TnT) (1,430 versus 10,584 pg/mL;  $p = 0.037$ ) and creatine kinase (CK) (3,496 versus 951 U/L;  $p = 0.05$ ) levels were higher in patients with moderate/severe AS. Regarding nocturnal hypoxemia, SpO<sub>2</sub>%, percentage of time with saturation < 90% and desaturation index (ODI) was higher in moderate/severe apnea (72% versus 80.9%;  $p = 0.001$ ; 36.3% versus 57.6%;  $p = 0.097$  and 22.4 versus 41.86 ev/h;  $p = 0.004$ , respectively). **Conclusion:** moderate/severe AS is associated with higher levels of myocardial damage markers and greater nocturnal hypoxemia.

### Prevalence of poor sleep quality and hypersomnia in patients with Parkinson's disease: experience in a tertiary center

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**Introduction:** sleep disorders are common in Parkinson's disease (PD) and occur in two thirds of patients, being among the non-motor symptoms that most severely affect their quality of life.

**Objective:** to provide sleep screening to all patients diagnosed with PD. **Material and methods:** all patients with a previous diagnosis of PD were evaluated within the neurology consultation for sleep disorders using the clinical tools: Pittsburgh sleep quality index (PSQI), Epworth scale,

STOP-BANG questionnaire and patient health questionnaire (PHQ-9). A complete clinical history was taken, focusing on sleep habits and risk factors. Patients with any sleep disorder were evaluated and continued their treatment according to their results. **Results:** between August 2021 and July 2022, a total of 47 patients with a diagnosis of PD who attended the neurology office were screened for sleep disorders. They were identified by PSQI 74.4% with poor sleep quality and 46.8% of patients had hypersomnia, identified by the Epworth scale. **Conclusion:** with this initiative, we present our experience and results incorporating routine screening for these disorders in a clinical setting outside a sleep clinic.

### Effects of sleep extension on attention during the course of the day

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**Introduction:** sleep extension consists of sleeping 10 hours or more, which tends to improve cognitive processes such as attention. **Objective:** to analyze the effects of sleep extension on attention during the course of the day. **Material and methods:** six university students participated (three males, three females; age:  $18.16 \pm 1.47$  years), who went through three control nights (slept from 12:00-08:00 hours) and three nights of sleep extension. Participants were recorded on a 29-hour constant routine protocol, in which illumination (< 5 lux), ambient temperature ( $24 \pm 1$  °C), posture, and food intake were held constant. In this protocol, attention was recorded by means of a continuous performance task. During sleep extension, three participants extended their sleep by going to bed earlier ( $3.30 \pm 0.91$  hours earlier) and the other three participants awakened later

( $1.44 \pm 0.10$  hours later). **Results:** in the first four hours of recording, no significant differences were found in the percentage of correct responses among all participants with sleep extension (93.83%) compared to eight-hour sleepers (88.83%), but significant differences were found in reaction times (extension: 363.47 m, 8 h: 407.45 m,  $U = 22.00$ ,  $p < 0.05$ ). In the last four hours of the recording, after 24 h without sleep, all participants with sleep extension had a higher percentage of correct responses on the attention task compared to 8-h sleepers (extension: 74.25%, 8 h: 55.80%,  $U = 18.00$ ,  $p < 0.02$ ). However, no significant differences in reaction time were found between the sleep extension group (363 ms) compared to eight-hour sleepers (407.45 ms). **Conclusion:** sleep extension improves attention, even when people have been exposed to sleep deprivation for 24 hours.

### Prevalence of epileptiform activity in patients with sleep parasomnias without rapid eye movements

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**Introduction:** parasomnias are undesirable behaviors that occur at sleep onset, during sleep or upon awakening from sleep. They are classified according to the stage of sleep during which they occur: non-rapid eye movement (NMOR) sleep parasomnias, rapid eye movement (REM) sleep parasomnias, and other parasomnias. The NMOR sleep parasomnias include arousal disorders (confusional awakenings, sleepwalking and night terrors). They are caused by abnormal activation in one area of the brain, while the rest of the brain remains in sleep. Predisposing and precipitating factors include maturational factors, epileptiform activity and sleep breathing disorders. The prevalence of epileptiform activity in healthy patients is 1.5% and in

patients with NMOR sleep parasomnias between 9.8-25% have been reported. One possible explanation is that patients with epilepsy have been reported to have been previously diagnosed as NMOR sleep parasomnias. **Objective:** to determine the prevalence of epileptiform activity in patients with NMOR sleep parasomnias. **Material and methods:** an exploratory, observational, retrospective study was conducted on patients with NMOR sleep parasomnias with polysomnographic recording with 10-20 montage and video in the period 2010-2020 who presented at least one episode of parasomnias during the recording. **Results:** a 38.5% prevalence of epileptiform activity was observed in patients with NMOR sleep parasomnias. **Conclusions:** in patients with NMOR sleep parasomnias the prevalence of epileptiform activity is higher than that reported in the healthy population.

### Polysomnographic variables in infants with bronchopulmonary dysplasia at an altitude of 2,240 meters above sea level

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**Introduction:** bronchopulmonary dysplasia (BPD) is a chronic lung disease as a consequence of multiple factors added to the immaturity of the airway; it causes a decrease in lung growth, as well as in pulmonary vessels, leading to a limitation in respiratory function that could favor the presence of sleep disorders due to a decrease in cortical stimuli and muscle activity, less central and peripheral sensitivity that physiologically lead to a decrease in  $\text{SpO}_2$  and an increase in  $\text{PaCO}_2$ . **Objectives:** to describe polysomnographic varia-

bles in children with BPD at an altitude of 2,240 meters above sea level. **Material and methods:** exploratory, observational, retrospective study in children with BPD with nap type polysomnography from January 2015 to July 2021 at the Sleep Disorders Clinic of the UNAM; polysomnographic variables were analyzed and grouped based on severity of dysplasia, prematurity, sleep stages and  $\text{CO}_2$  levels; statistical analysis was performed with SPSS 26 software. **Results:** 195 children, 51.7% male, mean age 42 days, 42.3% with moderate BPD. Mean awakening index 22.5 ev/h and apnea/hypopnea index 51.7 ev/h, NMOR sleep 64% and MOR 24%, minimum  $\text{SpO}_2$  67% ( $p = 0.010$ ) and  $\text{CO}_2$  39 mmHg ( $p = 0.333$ ). We observed differences in mild vs moderate BPD on arousal index ( $p = 0.028$ ) and minimum  $\text{SpO}_2$  ( $p = 0.044$ ), in mild vs. severe on arousal index ( $p = 0.082$ ) and in moderate vs. severe on minimum  $\text{SpO}_2$  ( $p = 0.004$ ); children with elevated  $\text{CO}_2$  levels presented a higher apnea/hypopnea index ( $p = 0.000$ ), higher sleep efficiency ( $p = 0.004$ ) and higher number of central apneas ( $p = 0.001$ ) and average  $\text{SpO}_2$  ( $p = 0.022$ ). **Conclusions:** children with BPD presented a higher rate of awakenings, increased light sleep, decreased deep sleep and REM; higher number of central apneas and desaturations. None presented hypoventilation. Children with elevated  $\text{CO}_2$  levels presented greater sleep efficiency, respiratory events and hypoxemia; there were no differences in sleep macrostructure or arousal response in NMOR and REM sleep. BPD may favor the appearance of respiratory disorders during sleep that predispose to alterations in neurocognitive development. Integration into a neurodevelopmental and early intervention program is suggested.

### Effects of sleep deprivation on sustained attention and its relationship to brain electrical activity

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**Introduction:** sustained attention is the ability to respond efficiently to environmental stimuli over an extended period of time; overall stability and performance over time on task are indicators of sustained attention. Attention can be affected by sleep deprivation. It is of interest to us to know how these changes in sustained attention are related to the electrical activity of the brain during task performance. **Objective:** to know the effects of sleep deprivation on sustained attention and its relationship with brain activity. **Material and methods:** 12 people without sleep disorders were deprived of sleep for 28 hours, remained awake in the laboratory and answered a visual continuous performance task while their brain electrical activity was recorded at the beginning of the session (12 hours, baseline) and at 16 hours the following day. **Results:** it was observed that with sleep deprivation variability in correct responses ( $T = 0.0$ ,  $p < 0.01$ ) and reaction time variability ( $T = 2.0$ ,  $p < 0.01$ ) increased, while performance worsened with time on task ( $T = 8.0$ ,  $p < 0.05$ ). Furthermore, in brain activity increased theta power (4-8 Hz,  $T = 0.0$ ,  $p < 0.01$ ) and decreased fast beta (22-32 Hz,  $T = 5.0$ ,  $p < 0.01$ ). We found a positive correlation between variability of correct responses and reaction time with delta ( $R = 0.75$ ,  $p < 0.01$ )  $R = 0.68$ ,  $p < 0.05$ ) and theta ( $R = 0.66$ ,  $p < 0.05$ ;  $R = 0.84$ ,  $p < 0.001$ ) bands and a negative correlation of performance with time on task with those frequencies (delta  $R = -0.76$ ,  $p < 0.01$ ; theta  $R = -0.62$ ,  $p < 0.05$ ). **Conclusions:** sleep deprivation caused a decrease in sustained attention. It was found that the higher the power of delta and theta the more sustained attention decreased when people were sleep deprived.