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**INVESTIGACIÓN ORIGINAL**

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## Sleep disorders and posttraumatic stress in raped victims

*Alteraciones del sueño y estrés postraumático en víctimas de asalto sexual*

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### | Summary |

**Objective.** To determine sleep disorders and posttraumatic stress symptoms in a group of raped female victims and to assess the causal influence by a survey of the association between exposed and unexposed groups and compare those events.

**Materials and methods.** Prospective matched double cohort study. Sample of raped women selected according to inclusion and exclusion criteria, which went to a Forensic Medicine Institute. A group of non-exposed women matched by age, gender, socioeconomic status, location, timing, and status was selected. We applied the Pittsburgh Sleep Quality Index, the Epworth Sleepiness Scale, and the Impact of Event Scale.

**Results.** Data distribution was not normal. Size, weight, and BMI were similar in both groups. We found statistically significant differences in the total score of the sleep quality

variables, subjective quality, efficiency and sleep disturbances, awakening early in the morning, not breathing, coughing or snoring, feeling too cold, feeling too hot, nightmares, use of hypnotics, daytime dysfunction and posttraumatic stress symptoms.

**Conclusions.** The presence of sleep disorders and posttraumatic stress symptoms in victims of rape are significant compared with a matched group of non-raped women in Bogotá.

**Key words:** sleep disorders, stress disorders, post-traumatic, disorders of excessive somnolence, rape.

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### Resumen

**Objetivo.** determinar alteraciones del sueño y síntomas por estrés postraumático en una cohorte de mujeres víctimas de asalto sexual y evaluar la influencia causal mediante la mensura de la asociación entre exposición y comparar eventos con un grupo de no expuestas.

**Materiales y métodos.** Estudio de doble cohorte, prospectivo pareado. Muestra de mujeres asaltadas sexualmente seleccionadas según criterios de inclusión y exclusión, que acudieron a valoraciones médico legales y una cohorte no expuesta pareada por edad, género, estrato socioeconómico, lugar, temporalidad y estado civil. Se aplicó el Índice de Calidad del Sueño de Pittsburg, la Escala de Somnolencia de Epworth y la Escala de Impacto de Eventos.

**Resultados.** La distribución de datos no fue normal. La talla,

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peso e IMC fueron similares en ambos grupos. Se hallaron diferencias estadísticamente significativas en las variables puntaje total calidad de sueño, calidad subjetiva, eficiencia y perturbaciones del sueño, despertar de madrugada, no respirar bien, toser o roncar, sentir frío, sentir calor, pesadillas, consumo de hipnóticos, disfunción diurna y síntomas por estrés postraumático.

**Conclusiones.** La presencia de alteraciones del sueño y síntomas por estrés postraumático en víctimas de asalto sexual son significativas en comparación con mujeres no asaltadas en Bogotá.

**Palabras clave:** trastornos del sueño, trastornos por estrés postraumático, trastornos de somnolencia excesiva, violación.

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## Introduction

Sleep disorders are a common ailment. According to several studies, about 35% of the people have presented a sleep disorder in their lifetime (1). It has been established that conditions that predispose its presentation such as mental disorders, some general medical diseases, environmental conditions and stressful situations, are caused by tragedies, economic loss, rape, etc. (1-3). Within the associated psychiatric diagnoses, there are those related to anxiety, including posttraumatic stress disorder (PTSD) (1-2).

In the Third National Mental Health Survey in Colombia, sleep disorders were not assessed, but data on the predominance of PTSD was gathered and known (4-5). Rueda-Sánchez et al, found that 11.4% (n=1505) of people in Bucaramanga had sleeping problems and insomnia 26.2% (6).

There is little literature on sleep disorders about victims of sexual crimes; although, it is recognized that these kinds of patients have these types of ailments (7-20). After rape, PTSD is present in up to 50% of the victims and among the symptoms are the presence of nightmares, insomnia, and comorbidity linked to sleep disorder breathing (SDB) such as obstructive sleep apnea (OSA) and upper airway resistance syndrome (UARS) (12-19). Unthreaded sleep disorders increase the risk of morbidity and deteriorate the victim's life quality (11, 18).

In literature, there are studies linked to sleep disorders, PTSD, and rape. Krakow et al, have been pioneers in discussing the traditional paradigm about insomnia and nightmares found in victims of rape with PTSD (8-9, 11-19). In these

victims, a predominance of sleep disorders between 77% and 80%, which mostly fit into insomnia, nightmares, and SDB, was reported (8-16, 18). In a series of raped victim's cases, including those who reported sleep complaints, 52% of the subjects had SDB and 60% had movement disorders during sleep. An increasing severity in PTSD whether there was a body mass index (BMI) or presence of symptoms of hyperarousal was also shown (16). In another study, it was shown that from the total of the raped victims (n=151), 77% had symptoms of SDB, sleep-related movements, or both; it was evaluated by the Pittsburgh Sleep Quality Index (PSQI) and the symptom scale of posttraumatic stress disorder (PSS), with high scores on the PSQI that reported low sleep quality, which were related to high scores in PSS and higher scores in PSQI if there was primary sleep disorder (8). In a case-control study of raped victims (n=187) with symptoms of PTSD, the diagnosis of SDB, nightmares, poor sleep quality, anxiety, depression, and deteriorated life quality was more frequent (14).

Nishith et al, in a series of women cases diagnosed with PTSD, reported the PSS for the entire sample was 28.84 (SD=9.68), indicating severe PTSD. The PSQI showed subjective quality medians, latency, duration, efficiency and sleep disturbance; there was use of hypnotics and daytime dysfunction consistent with moderate sleep problems (11).

There are few studies supported by findings polysomnographic (PSG). Nishit et al, in a number of studies, reported improvement on heart rate variability with cognitive therapy in REM sleep (R) in 7 raped women with PTSD (21). Breslau on a case-control study evaluated the sleep complaints in PTSD with PSG, concluding that they could represent an intensification of the short sleep micro stimulation perception during REM sleep (22).

The study has shown a high incidence of sleep disorders and PTSD in raped victims, and it partially rejects the paradigm that insomnia and nightmares are characteristic of PTSD, showing that it also could be related to primary sleep disorders. Subsequently, it has confirmed the need to find the dominance of sleep disorders and the presence of co-morbidities such as insomnia and nightmares with other primary sleep disorders to get a better diagnostic and treatment.

The aim of this study was to determine the presence of sleep disorders and posttraumatic stress symptoms in raped women victims and assess the causal influence by calculating the association between women exposed and not exposed to rape and compare the respective events. It also was intended to demonstrate the existence of comorbid symptoms such as insomnia and nightmares with other primary sleep disorders: SDB and periodic limb movement disorder (PLMD).

## Material and methods

This was an analytical, observational, matched double cohort study conducted with a population of raped women victims who attended forensic evaluations and a group of non-raped women matched by age, gender and supplied by the community of raped women. The sample was obtained from women who came to survey over a period of 7 months. For the observational, prospective double group study, the sample was calculated with the program: EpiInfo version 6.04, taking into account a dominance of the main phenomena of research: sleep disorders in not exposed women to 0.23, with a minimum incidence of 0.13 found and maximum of 0.49 according to the literature review, with a maximum error of 0.05, a confidentiality level of 99% and a target population given by the total number of surveys per year ( $n=635$ ) performed in women from 18 to 44 years old.

From the unexposed group, there was a woman for every woman exposed, matched by age, gender and provided by the community of raped women in a consecutive way during the data collection period. For the cross-descriptive study, a representative sample was calculated using the program: EpiInfo version 6.04 Population Survey, taking into account the population size from which the sample was obtained ( $n=635$ ), there was an expected predominance of the main variable studied, sleep changes in exposed women of 0.77, with a minimum prevalence of 0.52 found according to the literature review, with a confidentiality level of 99% and a target population given by the total number of surveys ( $n=635$ ) made. The year that this study was conducted in Colombia, 14,421 serological advices were made. In Bogotá, 3,746 tests were carried out to possible victims of sexual crimes, most of whom were female. There was a 10% increase for non-response in both groups.

We planned a probability sample with replacement in exposed subjects and convenience sampling in the unexposed individuals matched by age and gender and provided by the community of women exposed and who met the inclusion criteria. The data was collected during the research period, 2 groups: one of exposed ( $n=34$ ) and unexposed subjects ( $n=34$ ).

According to official statistics, there were 635 serological advices in women from 18 to 44 in Bogotá, 95% ( $603/635$ ) of these surveys were positively associated to rape. The monthly average of cases presented corresponds to ( $603/12=50.3$ ). Based on the above values, we proceeded to collect data from the serological advices made by Legal Medicine (322 probable cases of rape for the period studied); the rape diagnosis was confirmed by a reference to a positive advice of the same serological diagnosis ( $N=322/322$ ), the patients were immediately identified in the medical files with contact information (address

and / or phone) corresponding to the location of rape victims, finding this information only in  $59/322$ , (18.3%). From this group, the victims were selected for the implementation of the survey ( $N=34/322$ , 10.6%). All the participants signed consent forms, and the information was recorded in a notebook data logger designed for this purpose.

Group inclusion criteria to be considered were: being female, over 18 years and under 45 years old, live in Bogotá, know how to read and write, have a serological forensic examination with findings of rape, agreeing to participate in the study by informed consent. Exclusion criteria included having an inconclusive serological examination result, not rape and do not have address or telephone number.

For non-raped participants, it was included those who were within the exposed victim age range,  $\pm 5$  years, live in Bogota, from the same community of the raped women, know how to read and write, had no history of rape or sexual abuse and accept the participation in the study by informed consent. We excluded those who were not raped and that did not meet the prerequisites.

The measuring instruments used were the PSQI, the ESS validated locally (23, 24) and the Impact of Event Scale (IES) tested in several epidemiological local studies (25). The study was approved by the ethics committee of the Universidad Nacional de Colombia in the Medicine Faculty; it was modified according to the Helsinki Declaration recommendations, Health Ministry resolution 8430/1993 and the fundamental of sexual transgression victims' rights. The information was gathered by trained interviewers in psychiatric care in complete privacy and the victims were aimed to receive psychiatric and/or psychological treatment (26).

It is considered that most PTSD symptoms and sleep disturbances take place in the first 6 months after the shocking events; this is the reason why the symptoms measurement was made after the traumatic incident within the prescribed time (10-17, 19-20, 27).

For each exposed subject added to the study there was a non-raped woman included from the community to which the assaulted woman belonged, matched by age and gender. We used a measuring rod and a scale for measuring height and weight. The bias that may occur in the data recording process was virtually null, because a structured observational method was chosen. The statistical analysis of data was of a descriptive nature using nonparametric statistics, because the variables behavior was not normal. We compared the medians and the variables distribution by applying the Sign Test and the Match Rank Wilcoxon Test for variables that were linked to divorce and a comparison was made with the Exact McNemar's Test between the two groups of raped and non-raped women. The

database was generated in the Excel program of Microsoft Office Professional and analyzed with the statistical software.

Taking into account that this study has a research design: non-experimental, prospective and doubled matched group, in which there is an independent variable (rape) and two dependent variables (sleep disturbance and posttraumatic stress symptoms), the statistical method used for nominal variables was the McNemar Test with its respective odds ratio. Regarding the descriptive part of the study, frequency measures were used.

In this prospective analytic and observational double-cohort study rape was considered as an independent variable and sleep

disorders, posttraumatic stress symptoms, demographic variables and BMI as dependent variables.

## Results

The group of 34 women rape victims and the group of 34 non exposed women were matched by age, gender and belonging to the same community. The two groups studied were matched according to the demographic variables investigated, however by chance they were also matched by marital status, height, weight and BMI (Table 1).

**Table 1.** Comparative distribution of the variables height, weight, BMI and total scores of the scales: ESS, PSQI and IES in women assaulted and not assaulted.

| Variables | Assaulted / Not assaulted | Median | [95% Conf. Interval] |
|-----------|---------------------------|--------|----------------------|
| Height    | Assaulted                 | 1.59   | 1.554-1.61           |
|           | Not assaulted             | 1.6    | 1.557-1.63           |
| Weight    | Assaulted                 | 52     | 48.77 - 55.45        |
|           | Not assaulted             | 53     | 49.77 - 55           |
| BMI       | Assaulted                 | 21.28  | 20.16 - 21.77        |
|           | Not assaulted             | 20.83  | 20.18 - 22.38        |
| ESS *     | Assaulted                 | 8.5    | 5.77 – 10            |
|           | Not assaulted             | 6      | 5 - 7.22             |
| PSQI†     | Assaulted                 | 7      | 5 - 8.22             |
|           | Not assaulted             | 3      | 2 – 4                |
| IES‡      | Assaulted                 | 20     | 46 - 56.68           |
|           | Not assaulted             | 0      | 0 – 0                |

\*: ESS: Epworth Sleepiness Scale

†: PSQI: Pittsburgh Sleep Quality Index

‡: IES: Impact of Event Scale

The studied variables that resulted different clinically and statistically significant were: subjective sleep quality ( $p=0.0000$ ), sleep efficiency ( $p=0.0266$ ), sleep disturbances: waking up during the night or early morning ( $p=0.0213$ ), sleep disturbances total score ( $p=0.0001$ ), sleep disturbances: inability to breathe well ( $p=0.0020$ ), sleep disturbances: coughing or loud snoring ( $p=0.0215$ ), sleep disturbances: feeling cold ( $p=0.0015$ ), sleep disturbances: feeling heat

( $p=0.0078$ ), sleep disturbances: have “bad dreams” or nightmares ( $p=0.0015$ ), sleep medication use ( $p=0.0215$ ), daytime dysfunction ( $p=0.0002$ ), quality Sleep total score ( $p=0.0007$ ) and posttraumatic stress symptoms ( $p=0.0000$ ) (Table 2). The variables that were not statistically significant different were: sleep latency ( $p=0.0768$ ), sleep duration ( $p=0.4545$ ), getting up to go to the toilet ( $p=0.2668$ ), having pain ( $p=0.3018$ ) and sleepiness ( $p=0.1094$ ).

**Table 2.** Hazard ratio study variables between women assaulted and not assaulted.

|   | Assaulted  | Not Assaulted | Hazard ratio              | P value |
|---|------------|---------------|---------------------------|---------|
|   | n=34       | n=34          |                           |         |
|   | n %        | n %           | Assaulted / Not assaulted |         |
| <b>ESS * &gt;10</b>                                     | 10 (29.4%) | 4 (11.8%)     | 2.0 : 1.0                 | 0.1094  |
| <b>PSQI † &gt;5</b>                                     | 22 (64.7%) | 7 (20.6%)     | 3.1 : 1.0                 | 0.0007  |
| <b>IES‡ &gt;19</b>                                      | 32 (94.1%) | 5 (14.7%)     | 6.4 : 1.0                 | 0.0000  |
| <b>Inadequate sleep quality</b>                         | 18 (52.9%) | 1 (2.9%)      | 18.0 : 1.0                | 0.0000  |
| <b>Conciliation insomnia</b>                            | 17 (50.0%) | 9 (26.5%)     | 1.8 : 1.0                 | 0.0768  |
| <b>Chronic intermittent insomnia or early awakening</b> | 23 (67.6%) | 13 (38.2%)    | 1.8 : 1.0                 | 0.0213  |
| <b>Inadequate sleep duration</b>                        | 27 (79.4%) | 23 (67.6%)    | 1.2 : 1.0                 | 0.4545  |
| <b>Inadequate sleep efficiency</b>                      | 18 (52.9%) | 7 (20.6%)     | 2.6 : 1.0                 | 0.0266  |
| <b>Sleep disturbances &gt;10</b>                        | 20 (58.8%) | 3 (8.8%)      | 6.7 : 1.0                 | 0.0001  |
| <b>Have trouble sleeping because of:</b>                |            |               |                           |         |
| Getting up to go to the bathroom                        | 9 (26.5%)  | 4 (11.8%)     | 2.3 : 1.0                 | 0.2668  |
| Unable to breathe                                       | 10 (29.4%) | 0 (0.0%)      | 10.0 : 0.0                | 0.0020  |
| Coughing or snoring loudly                              | 9 (26.5%)  | 1 (2.9%)      | 9.0 : 1.0                 | 0.0215  |
| Feel too cold   | 23 (67.6%) | 8 (23.5%)     | 2.9 : 1.0                 | 0.0015  |
| Feel too hot  | 10 (29.4%) | 10 (29.4%)    | 1.0 : 1.0                 | 0.0078  |
| "Having bad dreams" or nightmares                       | 23 (67.7%) | 8 (23.5%)     | 2.9 : 1.0                 | 0.0015  |
| Have pain   | 10 (29.4%) | 5 (14.7%)     | 2.0 : 1.0                 | 0.3018  |
| <b>Use of sleeping medication</b>                       | 9 (26.5%)  | 1 (2.9%)      | 9.0 : 1.0                 | 0.0215  |
| <b>Daytime dysfunction</b>                              | 19 (55.9%) | 5 (14.7%)     | 3.8 : 1.0                 | 0.0002  |

\*: ESS: Epworth Sleepiness Scale

†: PSQI: Pittsburgh Sleep Quality Index

‡: IES: Impact of Event Scale

## Discussion

Studies on the frequency of sleep disorders in women raped victims are rare. However, as demonstrated, sleep disturbances in this population are also significant as happened in our study. The group of women exposed to rape comprised of 34 people, an identical number to that of women not assaulted (n=68) and its distribution was not normal. Now talking about the difference in days between the date of rape and the date of interview in relation to the score of the scales used (IES, PSQI and ESS) in exposed women were not statistically significant differences between the responses given according to normality pattern or disagree with the categorization of each one of these variables.

Comparing the results obtained in this study with data reported by Krakow et al, data found showed a slightly lower incidence of sleep disturbance in raped women (8, 14-18). In the group of raped women considered in this study, we found data on excessive daytime sleepiness 12/34 (35.29%), sleep disturbances > 10 points: 20/34 (52.94%), trouble

sleeping due to: having to get up to go to the bathroom: 9/34 (26.47%), unable to breathe well: 10/34 (29.41%), coughing or snoring loudly: 9/34 (26.47%) and daytime dysfunction: 19/34 (55.88%) that potentially can be correlated with SDB and PLMD. It is possible that minor incidents in these potential symptoms found are caused by the presence of a normal low average BMI for raped and non-raped women (raped/non-raped, BMI=21.28195/20.83226, 95% CI 20.16978-1.77765/20.18168-22.38815) different from the U.S. population studied.

Krakow et al, have discussed the traditional paradigm of insomnia and nightmares present in raped victims with post traumatic stress disorder (8, 14-18). This author suggests the existence of somnological comorbidity in posttraumatic stress and states that insomnia and nightmares cannot always be excluded as belonging to the same pathology, rather than it should be excluded primary sleep disorders such as OSA, UARS, PLMD and restless legs syndrome (RLS). This study makes a progress in this regard and finds variables treated as insomnia (waking during the night or early morning (p=0.0213) and

sleep latency, ( $p=0.0768$ ) the first one resulted statistically different while the second one did not. If it is taken into account that the excessive daily sleepiness variable was distributed in a statistically similar way in both groups and observing the incidence in both set of individuals, then a clinically important difference in the group of the exposed women was found that may explain in some way the result of clinically chronic insomnia and statistically significant. These incidents are high for both groups studied, compared to the general population. As is known, the most important causes of excessive daytime sleepiness are chronic distress sleep syndrome and SDB (28). This means that a substantial amount of the variable related to daytime sleepiness with chronic insomnia and posttraumatic stress symptoms would necessarily be explained by comorbidity with such disease; this is a very important finding in our study that calls into question the paradigm that relates insomnia to the PTSD as one of its primary symptoms. This study showed that chronic insomnia of multiple and early awakenings ( $p=0.0213$ ) does not only match to the comorbidity with PTSD, but also that a not established percentage would correspond to primary sleep changes mentioned previously; sleep disorders are correlated with scores over 10 at the ESS.

Another important fact not mentioned in the literature review is the presence of sleep disturbance: feeling cold ( $p=0.0015$ ) was found in the group of exposed women with a McNemar Odds Ratio that shows 6 times more risk to feel cold in the group of raped women than in those who were not victims, and there was something similar on the variable of sleep disturbances: feeling heat ( $p=0.0078$ ), symptoms mainly related to environmental changes (Bogota is 2,600 meters above sea level with an average temperature at night of 6-10 degrees C) and (48/68 (70.59%) of the sample which was from a low socioeconomic status (stratum 1-2 in a range from 1 to 6). Having problems sleeping because of feeling cold or heat can also correspond to symptoms of hyperarousal associated with anxiety, taking into account that the raped group showed significant posttraumatic stress symptoms ( $p=0.0000$ ). These symptoms are easy to dig into the forensic psychiatric examination of sexual victims; they suggest the presence of posttraumatic stress symptoms and/or sleep disorders as a direct risk factor (rape).

This study allowed to estimate the importance of sleep disorders in this affected population at a low cost compared to other media. Using scales it could be established that victims of rape have sleep disturbances caused by this significantly risky factor. Comorbidity was found between primary sleep disorders and PTSD, finding an important amount of the first ones in these patients similar to those reported by other authors (29-33).

Fail in diagnosing primary sleep disorders associated with PTSD or other mental disorders, leads to inadequate treatment, in this way, this study shows this suspect to be true, because the variables that support such primary sleep disorders are related (OSA, UARS, RLS and PLMD); the variable: "having trouble sleeping due to: not being able to breathe well" and "coughing or snoring loudly" undoubtedly contribute a significant percentage of insomnia and excessive daytime sleepiness in the raped sample corresponding to primary sleep disorders which are not determined by this study but that represent a major health problem to prevent and treat. Krakow et al. treated with cognitive behavioral therapy and test images treatment to crime victims with PTSD who had insomnia and nightmares. They related the successful treatment of these sleep disturbances with an improvement in posttraumatic stress symptoms, anxiety, depression and those patients who did not improve probably did not have primary sleep disorders (17).

In some of the variables statistically significant differences were not found, a situation that could be explained due to the high incidence of sleep disorders found in the sample of non-raped women for these variables. Another variable for comparison in sleep disturbances is: (having pain) ( $p=0.3018$ ) obtained in this study, with the findings made by Clum et al, who reported an increment in somatic complaints in women who are seeking treatment after rape and its relation to sleep disturbance present in PTSD that would act as a predisposing factor for future onset of these symptoms, a relationship that in this study was not statistically significant (19).

Rape is one of the most traumatic crimes known to humankind. Many victims remain affected not only by the humiliation of physical violation but by the appearance of sleep disorders and posttraumatic stress disorder as a result of this aggression. Some authors, including Breslau have conducted studies in PSG with victims of traumatic events; providing results with conflicting findings (34).

This research found that from the three main dependent variables studied, there were clinical and statistically significant differences in total scores of the PSQI and the IES. This did not happen in ESS where the difference was only clinical. Similarly Faravelli et al, report a higher incidence of PTSD, sexual, food, and mood disorders, as psychopathological consequences of rape in adult women compared with victims of traffic accidents, physical attacks and robberies (35).

The study's limitations involve the use of self-report scales and non-use of sleep studies such as PSG and/or Multiple Sleep Latency Test (MSLT), which are tedious and expensive. In the analysis of the influence of possible error sources that could explain the findings, it was considered likely sources of error or bias, confounding factors, and random weight in the

final results. Regarding the selection bias was zero, since the raped women were chosen based on a positive expert examination and in non-raped women were excluded those who had been victims of similar events in the past. The classification of individuals included into the study was rigorous; the sample was calculated with adequate statistically authority and there were included the required cases.

After discussing the results obtained, new hypotheses are arranged that need further study. In these inquiries, there will be the possibility of significant differences in daytime sleepiness between exposed and non exposed individuals, that as observed in this study did not show statistically significant findings but that leave the inquiry of what had been studied by self-report, subjective tests and not by laboratory studies.

The usefulness of the results obtained in this clinical practice is clearly seen as it identified that raped women are at high risk of sleep disorders associated with posttraumatic stress symptoms in the months following the shocking event. The incidences of these studied variables were higher in the raped than non-raped women (Table 2). In the forensic context, these findings are important because they show the presence of specific alterations of sleep and posttraumatic stress symptoms, which could be appropriately classified as psychic impact and encourage the victim to request compensation for the damage received. Although in this study, no validated scales were used in forensic populations where replication is important.

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### References

1. **Vela-Bueno A, de Iceta M, Fernández C.** Prevalencia de los trastornos del sueño en la ciudad de Madrid. *Gac Sanit.* 1999;1:441-8.
2. **Benca RM, Obermeyer WH, Thisted RA, Gillin JC.** Sleep and Psychiatric Disorders: a Meta-analysis. *Arch Gen Psychiatry.* 1992; 49:651-8.
3. **Escobar-Córdoba F, Echeverry-Chabur J, Lorenzana-Pombo P.** Evaluación clínica del insomnio. *Rev. Fac. Med.* 2001;49:81-8.
4. **Posada Villa J, Aguilar S, Magaña C, Gómez L.** [Prevalence of Mental Disorders and use of Services: Preliminary Results from the National Study of Mental Health, Colombia, 2003]. Prevalencia de los trastornos mentales y uso de servicios: resultados preliminares del estudio nacional de salud mental Colombia 2003. *Rev Colomb Psiquiatr.* 2003; 33:241-62.
5. Centro de Referencia Nacional sobre Violencia, Instituto Nacional de Medicina Legal y Ciencias Forenses. *Medicina Legal en Cifras.* Bogotá D.C. 2002.
6. **Rueda-Sánchez M, Díaz-Martínez L, Osuna-Suárez E.** [Prevalence insomnia risk factors in the general population]. Definición, prevalencia y factores de riesgo de insomnio en la población general. *Rev. Fac. Med.* 2008; 56: 222-34.
7. **Kendall-Tackett K.** The health effects of childhood abuse: four pathways by which abuse can influence health. *Child Abuse Negl.* 2002; 26: 715-29.
8. **Krakov B, Germain A, Warner TD, Schrader R, Koss M, Hollifield M, et al.** The relationship of sleep quality and post-traumatic stress to potential sleep disorders in sexual assault survivors with nightmares, insomnia, and PTSD. *J Trauma Stress.* 2001; 14: 647-65.
9. **White DP.** Tragedy and insomnia. *N Engl J Med.* 2001; 345: 1846-8.
10. **Lavie P.** Sleep disturbances in the wake of traumatic events. *N Engl J Med.* 2001; 345: 1825-32.
11. **Nishith P, Resick PA, Mueser KT.** Sleep difficulties and alcohol use motives in female rape victims with posttraumatic stress disorder. *J Trauma Stress.* 2001; 14:469-79.
12. **Krakov B, Melendrez D, Warner TD, Dorin R, Harper R, Hollifield M.** To breathe, perchance to sleep: sleep-disordered breathing and chronic insomnia among trauma survivors. *Sleep Breath.* 2002; 6:189-202.
13. **Krakov B, Artar A, Warner TD, Melendrez D, Johnston L, Hollifield M, et al.** Sleep disorder, depression, and suicidality in female sexual assault survivors. *Crisis.* 2000; 21:163-70.
14. **Krakov B, Melendrez D, Johnston L, Warner TD, Clark JO, Pacheco M, et al.** Sleep-disordered breathing, psychiatric distress, and quality of life impairment in sexual assault survivors. *J Nerv Ment Dis.* 2002; 190:442-52.
15. **Krakov B, Melendrez D, Pedersen B, Johnston L, Hollifield M, Germain A, et al.** Complex insomnia: insomnia and sleep-disordered breathing in a consecutive series of crime victims with nightmares and PTSD. *Biol Psychiatry.* 2001; 49:948-53.
16. **Krakov B, Germain A, Tandberg D, Koss M, Schrader R, Hollifield M, et al.** Sleep breathing and sleep movement disorders masquerading as insomnia in sexual-assault survivors. *Compr Psychiatry.* 2000; 41:49-56.
17. **Krakov B, Johnston L, Melendrez D, Hollifield M, Warner TD, Chavez-Kennedy D, et al.** An open-label trial of evidence-based cognitive behavior therapy for nightmares and insomnia in crime victims with PTSD. *Am J Psychiatry.* 2001; 158:2043-7.
18. **Escobar-Córdoba F.** Alteraciones del sueño y estrés postraumático en víctimas de asalto sexual en Bogotá. Estudio de cohorte [disertación]. Universidad Nacional de La Plata. 2004. <http://>

- sedici.unlp.edu.ar/search/request.php?id\_document=ARG-UNLP-TPG-000000790&request=request
19. **Clum GA, Nishith P, Resick PA.** Trauma-related sleep disturbance and self-reported physical health symptoms in treatment-seeking female rape victims. *J Nerv Ment Dis.* 2001; 189:618-22.
  20. **Krakow B, Hollifield M, Johnston L, Koss M, Schrader R, Warner TD, et al.** Imagery rehearsal therapy for chronic nightmares in sexual assault survivors with posttraumatic stress disorder: a randomized controlled trial. *JAMA.* 2001; 286:537-45.
  21. **Walsh J, Ustun TB.** Prevalence and Health Consequences of Insomnia. *Sleep.* 1999; 22:427-36.
  22. **Nishith P, Duntley SP, Domitrovich PP, Uhles M, Cook B and Stein P.** Effect of cognitive behavioral therapy on heart rate variability during REM sleep in female rape victims with PTSD. *Trauma Stress.* 2003; 16:247-50.
  23. **Escobar-Córdoba F, Eslava Schmalbach J.** [Colombian Validation of the Pittsburgh Sleep Quality Index]. Validación Colombiana del Índice de Calidad de Sueño de Pittsburgh. *Rev Neurol.* 2005; 40:150-5.
  24. **Chica-Urzola H, Escobar-Córdoba F, Eslava-Schmalbach J.** [Validating the Epworth sleepiness scale] Validación de la escala de somnolencia de Epworth Colombia. *Rev Salud Pública (Bogota).* 2007; 9:558-67.
  25. **Horowitz M, Wilner N, Álvarez W.** Impact of Event Scale: a measure of subjective distress. *Psychosom Med.* 1979;41:209-18.
  26. **Urrego-Mendoza Z.** [Vicissitudes of a Sexual Abuse Victim and Her Therapist in the Legalization about Mental Health in Colombia]. Vicisitudes de una víctima de violencia sexual y de su terapeuta, a la luz de la legislación sobre salud mental en Colombia. *Rev Colomb Psiquiatr.* 2003; Supl 1:47S-54S.
  27. **Krakow B, Sandoval D, Schrader R, Keuhne B, McBride L, Yau CL, et al.** Treatment of chronic nightmares in adjudicated adolescent girls in a residential facility. *J Adolesc Health.* 2001; 29:94-100.
  28. **Chica-Urzola H, Escobar-Córdoba F, Echeverry-Chabur J.** [Clinical Evaluation of Hypersomnia]. Evaluación clínica del hipersomnio. *Rev Colomb Psiquiatr.* 2004; 23:45-63.
  29. **Nofzinger BA, Buysse DJ, Reynolds CF III, Kupfer DJ.** Sleep disorders related to another mental disorder (no substance/primary): A DSM-IV literature review. *J Clin Psychiatry.* 1993; 54:244-55.
  30. **Aldrich MS, Brower KJ, Hall JM.** Sleep-disordered breathing in alcoholics. *Alcoholism Clin Exp Res.* 1999; 23:134-40.
  31. **Ancoli-Israel S, Martin J, Jones DW, Caligiuri M, Patterson T, Harris MJ, et al.** Sleep-disordered breathing and periodic limb movements in sleep in older patients with schizophrenia. *Biol Psychiatry.* 1999; 20:406-22.
  32. **Youakim JM, Doghramji K, Schutte SL.** Posttraumatic stress disorder and obstructive sleep apnea. *Psychosomatics.* 1998; 39:168-71.
  33. **Millman RP, Fogel BS, McNamara ME, Carlisle CC.** Depression as a manifestation of obstructive sleep apnea: reversal with nasal continuous positive airway pressure. *J Clin Psychiatry.* 1989; 50:348-51.
  34. **Breslau N, Roth T, Burduvali E, Kapke A, Schultz L, Roehrs T.** Sleep in lifetime posttraumatic stress disorder: a community-based polysomnographic study. *Arch Gen Psychiatry.* 2004; 61:508-16.
  35. **Faravelli C, Giugni A, Salvatori S, Ricca V.** Psychopathology after rape. *Am J Psychiatry.* 2004; 161:1483-5.