

**CHANGES IN THE
VIGIL-SUEÑO RHYTHM
AND DEPRESSION.
FACTORS TO BEAR IN
MIND REGARDING THE
RELATIONSHIP WITH
THE PANDEMIC AND
THE CONFINEMENT**

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Abstract: Studies on the sueño process have found the influence and consequences of the change in the vigil-sueño cycle on certain neuropsychiatric and psychological pathologies such as depression or anxiety. During the health crisis (COVID-19) measures were established to minimize contagions, including preventive confinement. This type of measures affected social relationships and physical exercise practice, two of the factors that can influence early maintenance of depression/anxiety problems. With the objective of giving a greater understanding of the possible relationship between the upheavals of the country and the depression surrounding the pandemic situation and the home confinement, a continuation of a theoretical review is presented. It is hoped that it will contribute to the dissemination of information on one of the consequences of this crisis, hoping that such a review can improve current preventive strategies on two of the problems associated with COVID-19.

Keywords: Confinement, COVID-19, wakefulness-sueño cycle, circadian rhythms, sueño disorders, depression.

INTRODUCTION

Living beings have developed, in order to adapt to their context, systems for measuring time. The daily cycles of light and darkness, for example, are required to be regulated in order to adapt to environmental changes. People show daily cycles that affect their physiological functions and their behavior. These cycles are generally intervals that appear approximately every 24 hours and that have been called circadian rhythms. One of the most important is the vigil-sueño cycle that translates into the sueño-activity interval. Circadian rhythms affect different organic variables, such as body temperature, blood pressure, heart rate, hormone release, motor activity, etc. (Alamo and López-Muñoz, 2010).

The relevance of the sueño on the different brain functions has been demonstrated, even managing to establish correlations between specific disorders, such as depression and changes in the sueño (Ríos-Flórez, 2019). On the basis of this, the need to support a greater understanding between the neurobiology of the patient and its influence on certain related pathologies becomes fundamental.

VIGIL-SUEÑO CIRCADIAN RHYTHM. CHANGES THAT COMPROMISE HEALTH

Circadian rhythms are those that allow the organism to regulate and adapt to biological variations. They are made up of a set of structures that coordinate and synchronize the vigil-sueño rhythm (Madrid et al., 2018). The human being has organized his activities based on the light and dark phases, adapting his biological rhythm to a cycle around 24 hours that allows him to achieve a homeostatic balance. Night darkness increases melatonin levels and favors regulation and onset of sleep (Altena et al., 2020). Certain situations of stress or deprivation of the sueño can modify this biological clock with consequences at a physical and psychosocial level (Torres et al., 2013). In addition to the cardiovascular and neuroendocrine consequences associated with changes in the vigil-sueño cycle, consequences have been observed in the mood of people, specifically with the increase in depressive episodes (Lyford et al., 2014). The depression is a classic symptom before the changes of sueño (BaHammam and Pandi-Perumal, 2010).

RELATIONSHIP BETWEEN THE PANDEMIC AND SUFFERING FROM SUFFERING, DEPRESSION AND ANXIETY

The finale of December 2019 Wuhan gives alarm on several cases of pneumonia of viral

origin. Months after China notified its first death related to SARS-CoV-2, commonly known as COVID-19 (acronym formed in English from COronaVIrus Disease and the year in which it spread). In March 2020, the disease had spread so much worldwide that the WHO (World Health Organization) declared it a global pandemic. In Spain, after some fatal cases, the government decreed a state of alarm and provisional home confinement. Some studies (Brooks et al., 2020) have linked negative effects on mental health associated with cuarentenas and Liu et al, highlighting the symptoms of post-traumatic stress and a poorer quality of life. On the other hand, the studies of Gao et al., (2020) showed, through a sample of 31 autonomic regions of China) high levels of anxiety and depression. Similar results were found in different countries. So, for example, a study in Argentina revealed differences in the heat of the country during the confinement. Specifically, 65.9% of the sample (720 people from the 1093 surveys) showed changes in the night sweats, asimismo, and 55.1% (602 people) showed problems in reconciling the sweat during the confinement (Pereira et al., 2021). In Spain, after a research with 1161 participants from all over the territory, problems with swine were also found in different age groups, with the younger age group (between 19 and 30 years old) reaching higher levels. Problems of depression and hopelessness were also appreciated. On the other hand, other studies demonstrate the relationship between anxiety and disorders of the person, signaling mainly a relationship between this illness and insomnia (Ebben and Spielman, 2008). Therefore, anxiety and depression commonly present disorders of the sueño and viceversa (Peterman et al., 2014). In turn, low levels of physical activity, due, for example, to depression or confinement, negatively affect the country (Altena et al., 2020).

JUSTIFICATION OF THE REVISION

In addition to the physical impact caused by COVID-19, the Coronavirus has supposed a serious psychological impact. The negative effects of the pandemic and the home confinement have been reflected in the population, especially in those people who presented with comorbidity or mental problems. The pandemic and the preventive isolation affected the way of living, of leisure and of relationship with others, causing negative consequences, causing a risk to health and increasing mental vulnerability. According to the investigations by Hartmann-Boyce et al., (2020) and Huang and Zao (2020) the reduction of salidas and physical inactivity can worsen depressive symptoms and risk anxiety, as well as causing problems with sleep, insomnia and daytime sleepiness (Lo y Lee, 2012; Losada-Baltar et al., 2020; Ramírez-Ortiz, et al., 2020; Reyes et al., 2020).

The warmth of the sueño, as well as their canidad, can be affected by people who have a virus, dying without being able to say goodbye or having to go to a collapsed hospital (Roy et al., 2020). Public health emergencies at the epidemiological level show different psychological consequences, highlighting the changes in the boss of sueño or insomnia in the third part of individuals in social isolation (Ramírez-Ortiz, et al., 2020). It is therefore essential to know the consequences of the disturbance of the vigil-sueño circadian rhythm in order to better understand and propose intervention strategies for the most associated disorders (anxiety or depression). This aspect, therefore, is what marks the objectives of the review: to analyze the main alterations of the patient in patients with depression and anxiety, as well as the relationship between the alterations of the patient and the desynchronization of the vigil-sueño rhythm in these illnesses, exposing them Physiological mechanisms involved and

possible therapeutic responses.

Based on these objectives, the epigraph of results will be articulated.

METHOD

After the exposition of the justification of the present review, we proceed to describe the systematic review method followed for the selection of the scientific sources used.

In order to compile representative and scientific data, three ScienceDirect databases were used,

Scopus and Central *ProQuest* (in table 1 a small description of each one is offered).

ScienceDirect	It provides a large part of the world's scientific production, housing more than 3500 academic journals, some related to the Sciences of Health and Medicine.
Scopus	It comprises the largest collection of citations and summaries of peer-reviewed bibliography, including books, conference proceedings and scientific journals in the field of Social Sciences and Medicine, among others.
<i>ProQuest</i> Central	It is currently the largest multidisciplinary database in the world, providing access to 47 complete databases and more than 300,000 full-text dissertations in different areas, including Psychology and Health Sciences.

Table 1. Databases used in the review.

SEARCH AND EXCLUSION CRITERIA

In the first instance, the search begins by setting the publication date, discarding any publication after the year 2000. Likewise, the thesauri that will guide the search are decided, mainly two: "Rhythm Vigil-Sleep + Depression" and, "Rhythm circadian sleep + Depression / Anxiety ", specifying that these words must be in the title, in the abstract or in the keywords in order to restrict the search as much as possible.

Once the sources had been selected, a small file was developed for each one (Table 2) to delimit the most significant aspects to carry out the analysis.

Factors/indicator	Description
Title	
Author	
Publication type	
Publication date	
Sample / participants	
Main goal	
Techniques / Instruments	
Main results	
Conclusions	

Table 2. File format for the review.

Regarding the reference language, it was decided to include both Spanish and English.

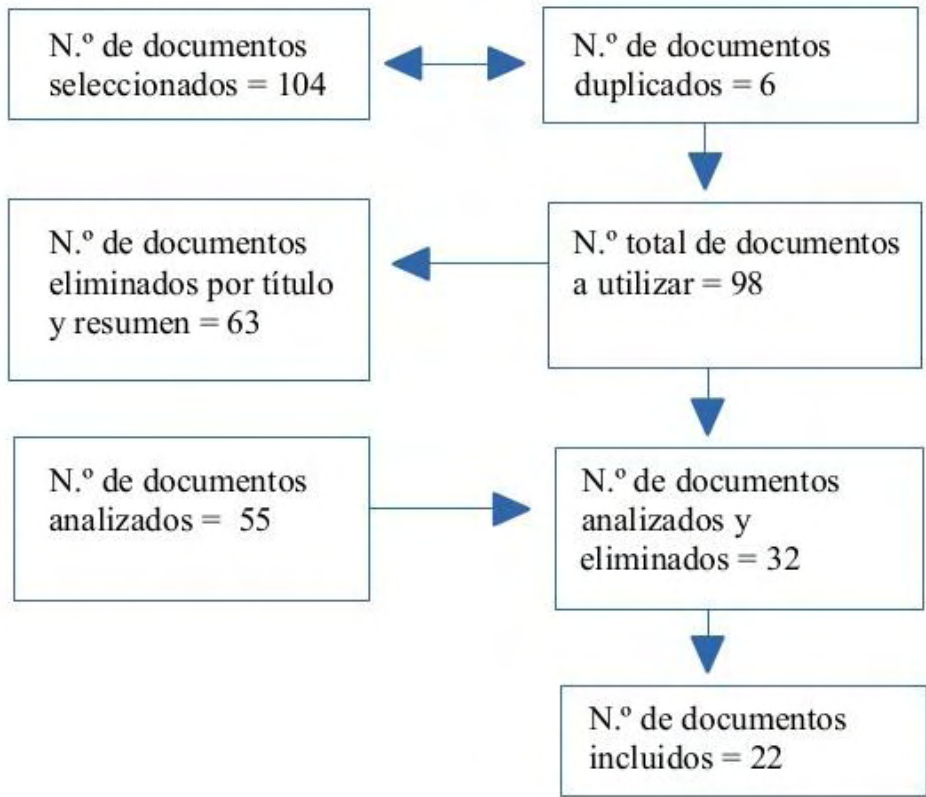
Regarding the type of work to include, it was decided to exclude conferences and conference proceedings. The order of appearance of the different investigations was taken into account because some studies appeared in more than one database, elaborating only one file per source.

In figure 1 the result of the selection can be seen.

RESULTS

MAIN SLEEP DISTURBANCES IN PATIENTS WITH DEPRESSION AND ANXIETY

Within the internal structures that allow life are the so-called circadian rhythms that can influence an internal desynchronization of the organism and be the cause of promoting or maintaining various diseases, including depression (Salgado et al., 2009). Depression and sleep disturbances go hand in hand; By feeding back, insomnia can worsen depression and in turn, among the symptoms of depression there is a high percentage of chronic insomnia (Cadevall et al., 2001). Sleep plays a fundamental role in the regulation of emotions, the alterations can have direct consequences on the emotional functioning



- Number of selected documents = 10
- Number of duplicated documents = 6
- Number of documents to be utilized = 98
- Number of documents eliminated by title and abstract = 63
- Number of documents analyzed and eliminated = 32
- Number of analyzed documents = 55
- Number of included documents = 22

Figure 1. Flowchart.

of the next day (Altena et al., 2020).

The main sleep disturbances in patients with depression and anxiety can be grouped into three blocks:

I. Impaired quality and quantity of sleep

Although it is true that the amount of sleep depends on each individual, some data can be established that are considered normalized, subjects with depression are affected by these basic sleep patterns. Different studies have shown how different sleep patterns (short -subjects who sleep six hours or less a day-, intermediate -between 7 and 8- and long -sleep more than 9 hours a day-) interact with the quality of sleep of the individual, being able to be responsible for problems or mood alterations and leading to greater depression and anxiety (Miró et al., 2005). After the studies carried out by Miró et al., (2006) it is concluded that depressed mood is related to both the quality and quantity of sleep. In addition, a relationship is found between the perception of individuals regarding satisfaction with their sleep (regardless of the hours) and the state of anxiety, finding that the subjects present greater anxiety if they consider that their sleep is of lower quality, and may be more susceptible to develop any pathological manifestation. The studies by Ramón-Arbués et al., (2019), carried out with 1055 Spanish university students also indicate a certain relationship between the rate of anxiety, depression and stress and insomnia in some of their categories.

II. Insomnia and Hypersomnia

Most of the subjects suffering from depression suffer insomnia and some may even report hypersomnia (Erro and Zandio, 2007), according to the review by Cano-Lozano et.al. (2003), approximately between 10-20%, understanding that insomnia would include all sleep initiation and maintenance

disorders and hypersomnia also somnolence or excessive sleep disorders (Pinel 2007).

III. Alterations in the duration and continuity of sleep

In subjects with depression, total sleep time decreases, and there is also an increase in sleep latency, increased wakefulness, or early awakening. As a consequence, changes in sleep phases and a decreased activation threshold can be observed. In this line, these people reflect a fragmented sleep and with it, a decrease in the quality of sleep (referred to above), that is, a decrease in effective sleep.

Sleep disturbances in REM

During sleep four phases are distinguished, the first characterized by alpha waves (low voltage and high frequency), the second characterized by an alternation of characteristic waves (the K complexes and sleep spindles), the third characteristic by the occasional presence delta waves, which give way to a fourth phase where this type of waves predominate. The sleep that is associated with phase one, in which rapid eye movements occur, is called REM, while the rest of the phases are called non-REM or NREM sleep. In subjects with depression, non-REM sleep disturbances are characteristic, in which the amount of slow waves corresponding to phases 3 and 4 is reduced, which reduces the total percentage of the time in which the individual dreams in short waves. Other analyzes also indicate a decrease in the number of delta waves and their production rate. (Cano-Lozano et al., 2003).

Sleep disturbances: REM

In depressed people, there is a latency in REM sleep during the first period, as well as different proportions depending on the time of night, in such a way that a higher proportion of REM is observed in the first third of the

night and a reduction in the last third. Some studies reflect intense REM sleep in depressed subjects, as the number of eye movements per minute increases (Cano-Lozano et.al. 2003).

In relation to this, Caballero (2009) distinguishes three main aspects in disorders of circadian rhythms and depression: a) advance or delay in the phase of rhythms with respect to the wake-sleep rhythm, b) decrease in the amplitude of the cycle and c) variations in timing from day to day (p. 33).

RELATIONSHIP BETWEEN SLEEP DISORDERS, ANXIETY AND DEPRESSION

The fact that anxiety and these types of problems occur together with great frequency suggests that there may be shared neurobiological diathesis, associated with common deficiencies (Uhde et al., 2009). Within the explanatory models Peterman et al., (2014). propose a comorbid association, that is; that both disorders (anxiety and sleep disorders) are influenced by a third factor or pathology, such as depression or problems triggered by stress. The beneficial effects of sleep are only achieved if the duration and architecture remain constant, since otherwise psychiatric disorders can start (Grubac et al., 2019). From this point of view, a circadian alteration in the wake-sleep rhythm is considered one of the classic symptoms in depression (Caballero, 2009).

PSYCHOPHYSIOLOGICAL RECORDING TECHNIQUES IN DEPRESSIVE PATIENTS

There are different ways of evaluating sleep, including psychophysiological recording techniques that allow measurements and evaluations of different parameters; The Electroencephalogram (EEG) measures the electrical activity of the brain, the Electrooculogram (EOG) measures eye

movements, the Submental Electromyogram (EMG) measures muscle tone, the Electrocardiogram (ECG) measures the activity of the heart, the Air Flow Record Inspired (nasobucal) and thoracic-abdominal Muscle Movement Amount that measures respiration or, Oximetry that measures the amount of oxygen in the blood (Cadevall et al., 2001).

In the mid-1970s, the first systematic investigations were carried out on the EEG pattern in depressive patients who were not taking drugs. Currently, Polysomnography (PSG) is also performed to assess the quantity and quality of sleep in depressed patients, since it simultaneously records different neurophysiological and cardiorespiratory variables (García-Gurtubay, 2007). The evaluation by PSG includes the three basic variables to distinguish the periods of wakefulness-sleep: EEG (electroencephalogram), EMG (electromyogram) and EOG (electro-oculogram).

From the use of these techniques some significant data can be highlighted:

- Previously, the shortening of REM sleep latency was pointed out as a possible biological marker of primary depression, currently studies are contradictory, since short REM sleep latency has been described in more than ten different disorders, such as for example, schizophrenia or dementia.
- There is not enough data to affirm that any sleep parameter, by itself, is specific to depressive disorder, although it is true that sleep disturbances have a higher percentage in depression than in other psychopathological disorders.
- It seems that various clinical and psychosocial factors can affect the sensitivity of the results, for example, age, intensity or type of depression, etc.

- The computerized analysis of the EEG, called sleep microarchitecture, provides a more complete description, since it introduces an analysis of the interhemispheric differences, where a decrease in delta amplitude is observed in patients with depression during the first hundred minutes of sleep, as well as high, fast-rate activity, especially in the right hemisphere. Beta activity is 20-30% higher in the right hemisphere than in the left during REM sleep (Cano-Lozano et al., 2003).

Characteristic changes in the records have been described through the use of the polysomnograph in subjects with depression compared to subjects without depression, such as a decrease in sleep efficiency, a decrease in slow waves in sleep, an abnormal sleep distribution REM during the night -accumulating in the first phases-, as well as an increase in the density of REM sleep and less delta activity during the first sleep cycle (Soria and Urretavizcaya, 2009).

RELATIONSHIP BETWEEN SLEEP DISTURBANCES AND DESYNCHRONIZATION OF THE WAKE-SLEEP RHYTHM IN DEPRESSION

The human species adapts to changes in the environment by developing certain circadian rhythms. The most important is the daily cycle of light and dark (sleep-wakefulness), however, sometimes some individuals cannot maintain this synchrony between the internal clock and the environment, thus producing the so-called internal desynchronization (Pinel, 2007).

Some symptoms of depressive disorder are linked to the functioning of the circadian system, causing changes in mood, attention span and increased anxiety. In turn, depression itself makes the subjects who suffer from

it more vulnerable to desynchronization. For example, in depressed patients with melancholic symptoms, a sleep disturbance is observed, which leads to an early awakening and a worsening of the mood, considered both symptoms of endogenous depression, present between 65 and 90%. In addition, it is estimated that approximately 80% have insomnia in some of its forms; initial insomnia (difficulties in conciliation), medium insomnia (intermittent awakenings) and / or terminal insomnia (early awakening; Soria and Urretavizcaya, 2009). Gillin (1983) and Gillin-Borbely (1985, cited in Lorenzo and Barbanoj, 2000) have determined that the major sleep disturbances associated with endogenous depression in adults is a shortening of REM sleep latency and an increase in the duration of sleep. REM sleep, especially in the early part of the night.

In short, in subjects with depression, internal regulators are altered, which in turn produces an alteration in the sleep-wake cycle, affecting total sleep time, slow wave sleep, short REM sleep latency and sleep efficiency, which translates into a decrease in the cycle with respect to subjects who do not suffer from depression (Cano-lozano et al., 2003), that is, depression results in an advancement of the endogenous circadian system and relationships of abnormal phase between various diurnal rhythms (Soria and Urretavizcaya, 2009).

PHYSIOLOGICAL MECHANISMS INVOLVED IN DISTURBANCES OF THE WAKE-SLEEP CYCLE IN DEPRESSION

People with depression present altered wake-sleep cycle, mood changes during the day and periodic recurrences, but also show altered several endocrinometabolic parameters such as cortisol secretion (in patients with melancholic depression, the inability to suppress plasma cortisol with

1mg of dexamethasone), thyroestimulating hormone, melatonin and monoamines, in addition to an alteration in body temperature and alterations related to hormonal factors (Soria and Urretavizcaya, 2009):

1. Existence of hyperactivity of the hypothalamic-pituitary-adrenal (HHA) axis -referred to alterations in cortisol secretion-.
2. Flattening of the TSH response to TRH. in the hypothalamic-pituitary thyroid (HHT) axis.
3. Abnormal secretion of growth hormone (GH) in depressed individuals, especially at night.
4. Significant reduction in melatonin secretion during the night period (Caballero, 2009)

With the technological process and neuroimaging techniques, it has been possible to locate the alterations of the different neuronal circuits involved, thus it is estimated that the neocortex and the hippocampus are involved in the cognitive aspects of depression and that, in turn, it is the hippocampus that mediates neurovegetative symptoms such as sleep, thus establishing a relationship of the associated alterations in these areas (Zandio et al., 2002). Along these lines, the studies by Pinel (2007) conclude that specific lesions of the suprachiasmatic nuclei (SNQ) of the medial hypothalamus are responsible for the alteration of some circadian cycles, including that of wakefulness-sleep. On the other hand, certain antidepressant drugs -which act on the serotonergic pathway- may also be responsible for the alteration of the cycle (Álamo and López-Muñoz, 2010; Ríos-Flórez et al., 2019).

EXISTING THERAPEUTIC RESPONSES FOR RESYNCHRONIZATION OF THE WAKE-SLEEP CYCLE IN DEPRESSION

As previously mentioned, the correct

functioning of the circadian cycle can be affected by the availability or exposure to different environmental stimuli. Therapeutic strategies have been developed in order to resynchronize the alterations that appear in depression. Following Soria and Urretavizcaya (2009) they can be divided into two groups:

a) Pharmacological treatments

The use of drugs, such as lithium salts, (antidepressant treatment) has been shown to lengthen the circadian period, as well as an inhibition of glycogen-synthetase-kinase (GSK), responsible for some components of the molecular clock. In general, after 3 or 4 weeks with antidepressant treatment, the subjects obtain improvements in the quality of sleep, however, certain drugs have shown the opposite effect, fundamentally altering REM sleep. Some antidepressants with 5-HT receptor antagonist activity, however, promote the initiation and continuity of sleep although they can cause daytime sleepiness. That is why, despite having shown some drugs in certain studies to be effective, it seems that others, such as SSRIs and SNRIs, for example, can even worsen insomnia. If to all this we add the limitations and side effects, it seems appropriate to look for alternatives.

The treatment of chronobiological alterations of the wake-sleep rhythm is currently carried out with synthetic drugs derived from melatonin, showing great efficacy (Escames and Acuña-Castroviejo, 2009).

b) Non-drug treatments

They are used as an alternative to antidepressant drug treatments, among the various possibilities include bright light therapy (their exposure in the morning has shown advances in phases in circadian rhythms), social and interpersonal rhythm therapy (it is intended with This strategy will restore

normal circadian rhythms and depressive state in general) and sleep deprivation (an effect similar to antidepressant has been observed after a night of sleep deprivation, obtaining an improvement in daytime mood, however it is not long-lasting).

Cognitive behavioral therapy for insomnia has seen results by modifying situations generated by stress (Åkerstedt, 2006; Altena et al., 2020). Special emphasis is placed on psychoeducational therapies on sleep hygiene (exposure to sunlight for at least half an hour to improve the production of melatonin and avoid certain beverages -coffee or alcohol-) as well as relaxation and mediation therapy and stimulus control (avoiding intense exercise before going to bed, adjusting the room temperature at bedtime or having a routine when going to bed and getting up; Baglioni et al., 2020).

HOW DOES CONFINEMENT AND STRESS INFLUENCE DEPRESSION?

Homeostatic mechanisms govern sleep and wake times, in such a way that when a person needs to sleep, the homeostatic process makes them feel drowsy and when they have had enough sleep it wakes them up (Carús-Cadavieco and Andrés, 2012). The wake-sleep process is a basic need, but sleep habits can be modified by some sociocultural circumstances, such as COVID-19 and home confinement, triggering sleep disorders. The initiation and maintenance of sleep require that the ascending arousal systems be suppressed (Machado et al., 2021), however, some concerns can hinder this process. Greater neuronal activity during wakefulness, such as excessive concern about the virus or possible contagion, entails a proportional accumulation of metabolic factors that can influence sleep (Carús-Cadavieco and Andrés, 2012). Likewise, social isolation increases the possibility of insomnia or inadequate rest at

night. These types of situations are associated with the appearance of fatigue during the day (Gené-Badia et al., 2016) and with problems of stress, anxiety and / or depression (Altena et al., 2020). The stress caused by the pandemic can trigger emotional instability, fear and anxiety in the face of an unknown disease, the fear that someone close to you may die, etc., can mediate the development of depressive symptoms.

During the confinement, the media flooded their news programs and programs with news about the pandemic. Following this type of news for several hours can raise levels of anxiety or depression (Huang and Zhao, 2020). In this sense, the stress that this type of news may have would imply a greater physiological and psychological activation associated with the increase in the function of the HHA axis (Hypothalamic, Pituitary and Adrenal) which in turn has been related to a fragmented sleep or a reduction in the NREM sleep stage (Åkerstedt, 2006). In this sense, there is a demonstrated relationship between the wake-sleep cycle and anxiety disorders (Verbitskii, 2018). Confinement itself can have negative effects on various factors that influence sleep quality: uncertainty about your job or safety situation, concern about the health of your loved ones and your own, changes in routines, inability to participate in Social events or rewarding activities, etc., can affect the number of hours of sleep (Altena et al., 2020). Likewise, those people who live without company or their own lack of regular social interaction can increase anxiety and decrease the quality of sleep (Wakefield et al., 2020).

CONCLUSIONS

Although there are still many studies on the effects on mental health related to confinement or COVID-19, they concluded that the pandemic has had a great negative

impact, causing an increase in symptoms related to depression, anxiety, stress and insomnia (Torales et al., 2020). It is predictable that behind the finalization of preventive confinement and the call “vuelta a la normalidad”, people have recovered their sueño routines and the level of anxiety has diminished. In the same way, if the most acute cases of depression have been able to descend, it is important to know the effects that can have the heat and the ability of the patient in the maintenance and/or the appearance of health problems. The importance of this review is precisely based on giving to know to a greater extent this information can provide greater knowledge to suppose a better prevention. Since, unfortunately, it seems that COVID-19

has arrived to stop and that the new strains can return to the social and contextual restriction measures being resumed, all communication can help to minimize the possible associated effects. It is important in these circumstances that an orderly wake-sueño cycle is restored to minimize the negative effects. In conclusion, the quality and capacity of the person are important for an adequate mental and emotional health. A better understanding of the effects of confinement on certain aspects of health will make it possible to establish guidelines to mitigate the negative effects of confinement. A healthy sueño can be the key factor to positively face the current health crisis.

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