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REVIEW ARTICLE

Classified diagnosis of sleep disorders and treatment: a review

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ABSTRACT

Sleep disorders are conditions that are characterized by the disturbance of the usual sleeping pattern or sleeping behavior. These disorders cause distress and result in impairment of day function as they affect social activities, work, and driving. Sleeping disorders can appear as complaints of abnormal movements during sleep, insufficient, or excessive sleep. The most prevalent sleep disorder includes insomnia. The present review discusses the diagnosis of sleeping disorders based on their classification and treatment of insomnia. We obtained the articles included in this review through an online research process using scientific websites and several keywords. The articles were selected based on inclusion criteria. There were 12 articles included in writing the current review; the review was written under titles in the discussion part. The sleeping disorders are classified according to many classification systems. International Classification of Sleep Disorders, Third Edition is the most common classification system. Insomnia is the most prevalent sleeping disorder; it can be treated with non-pharmacotherapy and pharmacotherapy.

Keywords: Sleep disorders, insomnia, classification, diagnosis, treatment.

Introduction

Sleeping disorders are associated with several dysfunctions of most body systems. Sleeping disorders can be represented as excess sleep, insufficient sleep, or abnormal movements during sleep [1]. The diagnosis of sleeping disorders relies on history and physical examination, diagnosis according to the class of the disease and laboratory investigation [2]. Regarding the diagnosis of sleeping disorders, all criteria must be met to establish a diagnosis, unless otherwise specified. However, individuals with clinically significant sleep disorders do not meet all the criteria for a given diagnosis. In such cases, provisional diagnoses with careful follow-up and retesting may be in order. The criteria's application should be guided by the notes that follow many of the criteria sections [3]. In this review, we discuss sleeping disorders based on the classification and the treatment of insomnia as the most frequent sleeping disorder.

Literature Search

We used an online research process to search for scientific articles related to our subject to be included in this review. We searched for articles related to the current subject through scientific websites such as Google Scholar and PubMed using several keywords, including "diagnosis, classification, sleeping disorders, and treatment." We obtained 25 articles related to our subject; after revising the titles of the articles, the abstract, reviewing the main titles inside articles, and the years of publications, we included only 12 articles. We excluded 13 articles as they were either duplicates of other articles, repeating the same information, or not concentrating on the current subject. The included articles were published between 2010 and 2019.

Discussion

Diagnostic classification of sleeping disorders

Four main categories of sleeping disorders were listed by the international classification of sleep disorders diagnostic and coding manual 2000. These categories include dyssomnias, parasomnias; sleep disorders associated with mental, neurological, or other medical conditions, and proposed sleep disorders [2]. Dyssomnias are diseases characterized by difficulty initiating or

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maintaining sleep or excessive sleepiness [4]. This category can be divided into intrinsic, extrinsic, and circadian rhythm sleep disorders based on the parapsychological mechanisms [4-9]. Intrinsic sleep disorders originate within the body or arise from the causes within the body. This group includes idiopathic and psychophysiological insomnia, obstructive sleep apnea syndrome, narcolepsy, restless legs syndrome, and periodic limb movement disorder [4-7]. External factors cause extrinsic sleep disorders. They include environmental sleep disorder, inadequate sleep hygiene, insufficient sleep syndrome, adjustment sleep disorder, sleep-onset association disorder, limited-setting sleep disorder, and hypnotic-dependent sleep disorder [4-7]. Circadian rhythm sleep disorders are characterized by a disturbance between the sleep pattern and the desired or societal sleep norm [4-9]. Circadian rhythm sleep disorders involve advanced sleep phase syndrome, delayed sleep phase syndrome, and shift work sleep disorder [2]. Parasomnias are characterized by undesirable behavioral and physical phenomena that occur predominantly during sleep [4-7]. This category includes disorders of partial arousal, arousal, and sleep-stage transition [2]. Sleep disorders associated with mental, neurological, or other medical disorders are another category of sleep disorders. Mental conditions that affect sleeping and cause sleep disorders include anxiety, mood disorders, alcoholism, and panic disorders, whereas dementia, cerebral degenerative disorders, sleep-related epilepsy, parkinsonism, sleep-related headache, and electrical status epilepticus of sleep are neurological condensations associated with sleep disorders [4,10]. Also, medical conditions cause sleep disorders, such as sleep-related asthma, peptic ulcer disease, irritable bowel syndrome, fibromyalgia, sleeping sickness, chronic obstructive pulmonary disease, sleep-related gastroesophageal reflux, and nocturnal cardiac ischemia [4,11-14]. The fourth category of sleep disorder in this classification is proposed sleep disorders, which include sub-wakefulness syndrome, sleep hyperhidrosis, pregnancy-associated sleep disorder, short sleeper, long sleeper, sleep-related laryngospasm, fragmentary myoclonus, menstrual-associated sleep disorder, terrifying hypnagogic hallucinations, sleep-related neurogenic tachypnea, and sleep choking syndrome [4]. Currently, there are three main diagnostic classification systems that clinicians use to classify sleep disorders. These classification systems include the International Classification of Sleep Disorders, Third Edition (ICSD-3) [15], the Sleep Disorders Section of the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5)[16], and the International Classification of Diseases, Tenth Edition (ICD-10) [17].

ICSD-3 is the most advanced classification of sleep disorders, and it is used by sleep experts [18]. This classification system builds on the necessary foundation of ICSD-2 [3]. The American Academy of Sleep Medicine described 70 highly specific diagnoses classified into six main clinical classes: insomnia, sleep-related breathing disorders, central disorders of hypersomnolence, circadian rhythm sleep-wake parasomnias, and sleep-related movement disorders. Other diseases not included or fitted in the previous six classes are included in a class called “Other.” The pediatric disorders are incorporated with each of the clinical classes, except for the obstructive sleep apnea, as it provides a specific delineation between pediatrics and adults. The ICSD-3 classification system provides general diagnostic criteria for each condition [15]. According to the ICSD-3 system, the classification of sleeping disorders is shown in Table 1 [15].

The second classification system is the DSM-5, which general medical and mental health clinicians use as they are not experts in sleep medicine. This classification system shows high concordance with the ICSD-3. The American Psychiatric Association publication classified the sleeping disorders into 10 groups of disease; insomnia disorder, hypersomnolence disorder, narcolepsy, breathing-related disorders, circadian rhythm sleep-wake disorders, NERM sleep arousal disorders, nightmare disorder, REM sleep behavior disorder, restless legs syndrome, and substance/medication-induced sleep disorder. This classification system also includes unspecified or other specified categories that can be applied to assist with assigning codes to conditions that do not otherwise fit into any of the 10 categories; this is similar to the ICSD-3 classification. Another similarity is that the DSM-5 does not separate adult and pediatric diagnoses; it provides general diagnostic criteria for adults and pediatrics conditions and outlines specific developmental features that may exist [18].

The third classification system is the ICD-10, which is less far complicated than ICSD-3. It was explained by the World Health Organization [17]. This system classifies the sleeping disease into two main categories based on their origin; organic and non-organic. The organic sleep disorders are assigned by the code "G"; this category focuses on medically and neurologically based sleep disorders and diseases of the nervous systems, such as narcolepsy and sleep apnea. Whereas non-organic sleep disorders are classified using "F" codes, this category involves behavioral and mental disorders. It involves three types of conditions; dyssomnia, parasomnias, and sleep disorders secondary to psychiatric and medical disorders [18].

Insomnia and its treatments

Insomnia

Insomnia refers to sleep disturbance, where the individual suffers from problems of falling asleep, staying asleep, or being unable to restore sleep upon awakening [19]. Insomnia leads to inadequate quality and quantity of sleep [20]. Insomnia is characterized by repeated difficulty with sleep initiation [21]. Insomnia affects almost 20% of the adult population [20]. Insomnia symptoms can occur in 33%-50% of the adult population; also, it can occur occasionally or persistently [19]. Almost 10% of the United States population experience insomnia every

177 ***Table 1.*** *The ICSD-3 classification system.*

Class	Sub-class	Disorders
1. Insomnia	-	Chronic insomnia disorder Short term insomnia disorder Other insomnia disorder Isolated symptoms and normal variants
2. Sleep-related breathing disorders	(A) Obstructive sleep apnea disorders	Adult Obstructive sleep apnea Pediatric Obstructive sleep apnea
	(B) Central sleep apnea syndrome	Central sleep apnea with Cheyne-Stokes breathing Central sleep apnea due to disorders without Cheyne-Stokes breathing Central sleep apnea due to high altitude periodic breathing Central sleep apnea due to medication or substance Primary central sleep apnea Primary central sleep apnea of infancy Primary central sleep apnea of prematurity Treatment-emergent central sleep apnea
	(C) Sleep-related hypoventilation disorders	Obesity hypoventilation syndrome Congenital central alveolar hypoventilation Late-onset central hypoventilation with hypothalamic dysfunction Idiopathic alveolar hypoventilation Sleep-related hypoventilation due to medication substance Sleep-related hypoventilation due to medical disorder
	(D) Sleep-related hypoxemia disorder	-
	(E) Isolated symptoms and normal variants	Snoring Catathrenia
3. Central disorders of hypersomnolence	-	(a) Narcolepsy (I) (b) Narcolepsy (II) (c) Idiopathic hypersomnia (d) Kleine-Levin syndrome (e) Hypersomnia due to a medical disorder (f) Hypersomnia due to a medication or substance (g) Hypersomnia associated with a psychiatric disorder (h) Insufficient sleep syndrome
4. Circadian rhythm sleep-wake disorders	-	(i) Delayed sleep-wake disorders (ii) Advanced sleep-wake phase disorder (iii) Irregular sleep-wake rhythm (iv) Non-24 hours sleep-wake rhythm disorder (v) Shift work disorder (vi) Jet lag disorder (vii) Circadian rhythm sleep-wake disorder not otherwise specified
5. Parasomnias	(A) NREM-related parasomnias	-Disorders of arousal from NREM sleep -Confusional arousal -Sleepwalking -Sleep terrors -Sleep-related eating disorder
	(B) REM-related parasomnias	-REM sleep behavior disorder -Recurrent isolated sleep paralysis -Nightmare disorder
	(C) Other parasomnias	-Exploding head syndrome -Sleep-related hallucinations -Sleep enuresis -Parasomnia due to medical disorder - Parasomnia due to medication or substance - Parasomnia, unspecified
	(D) Isolated symptoms and normal variants	Sleep talking
6. Sleep-related movement disorders	-	(a) Restless legs syndrome (b) Periodic limb movement disorder (c) Sleep-related leg cramps (d)Sleep-related bruxism (e) Sleep-related rhythmic movement disorder (f) Benign sleep myoclonus of infancy (g) Proprispinal myoclonus at sleep onset (h) Sleep-related movement disorder due to medical disorder (i) Sleep-related movement disorder due to medication or substance (j) Sleep-related movement disorder, unspecified

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night for at least 2 weeks [22]. Insomnia is more prevalent among women, and its prevalence ranges from 10% to 30% [23,24]. Insomnia can be classified according to the duration into acute, sub-acute, and chronic; and according to severity into mild, moderate, and severe [4]. The causes of insomnia can be physiological and/or psychological [19]. The most frequent cause of transient insomnia is stress related to work, short-term, emotional problems, and medical conditions, whereas chronic insomnia is associated with family stress [19,25]. In transient insomnia, the symptoms are usually resolved once the stress is removed or reduced [2]. In about 40% of insomnia cases, chronic insomnia can be developed [15]. The consequences of insomnia include poor concentration, disturbance of memory and mood, low energy, psychomotor slowness, fatigue, and overall reduced quality of life [19]. Insomnia can be divided into psychophysiological, idiopathic, and paradoxical insomnia. Psychophysiological insomnia is the most frequent type that must last at least for 1 month to be classified as psychophysiological insomnia. Idiopathic insomnia is also known as life-long insomnia; it is first identified in early childhood or infancy and continues throughout the patient's life. Paradoxical insomnia was formerly termed sleep state misperception; in this type, the patient complaint of insomnia with no evidence of insomnia [15]. Insomnia is diagnosed by evaluating the patient history that includes evaluation of contributing medical or psychiatric conditions [21]. The patient reports dissatisfaction with sleep and other daytime symptoms for at least three nights per week and persists for 3 months [15]. Although subtypes of insomnia have been delineated [15], the diagnosis and treatment are similar [1].

The treatment of insomnia

The treatment of insomnia includes non-pharmacological and pharmacological interventions [1]. Several non-pharmacological interventions have been developed for the treatment of insomnia that showed success in the management process [19]. The initial treatment strategy should consider other co-morbidities, medical conditions, substance abuse, and psychiatric conditions that cause sleep disturbance and participate in the onset of insomnia [1,19]. Non-pharmacological treatment involves sleep hygiene instruction and stimulus control procedures [19]. Sleep hygiene instructions include series of recommendations that should be performed by the patient, such as maintain a regular sleep-wake schedule, keep a comfortable environment for sleeping, and avoid drinking caffeine or stimulants after lunch, avoid alcohol, intense exercise, or smoking before bedtime, avoid eating a large meal before going to sleep, and avoid long naps that takes more than 30 minutes [19]. The American Academy of Sleep Medicine recommended the stimulus control procedures as the first non-pharmacological intervention developed for chronic insomnia [26-29]. The instruction of stimulus control include going to sleep when feeling sleepy only; activities should be carried out elsewhere, such as reading, watching TV, and listening to music, the individual should get out of the bed and do different non-arousing activity if the individual feels unable to sleep after 20 minutes, the previous action should be repeated if the patient became unable to sleep after returning to the bed, the patient should create a consistent sleep schedule; finally the napping is prohibited [26,27,29]. If the patient reported persistence of sleep complaints, then cognitive behavior therapy (CBT), relaxation, and sleep restriction should be introduced [30].

CBT and hypnotic medications are treatments for insomnia [21]. In a meta-analysis, short-term hypnotics effectiveness alone or combined with CBT was reported, whereas CBT alone resulted in a higher sleep latency reduction [31]. Other studies [32,33] demonstrated that CBT, combined with pharmacotherapy, was superior to pharmacotherapy alone. Moreover, improvement with CBT alone was maintained at 10-24 months of follow-up.

The pharmacotherapy of insomnia may be appropriate when the treatment duration is short [1]; the insomnia pharmacotherapy includes several medications that were licensed as hypnotics [20]. Hypnotics reduce the time to sleep onset and the episodes of waking in sleep as well as increases the total sleep time [34]. A short course of Z-hypnotic is recommended as the first line of insomnia treatment [35]. Other insomnia medications include chloral derivatives, anti-histamine, melatonin, benzodiazepines, and clomethiazole [36]. Benzodiazepines are cheap and ubiquitous; however, they are associated with several problems such as hypotension, excessive sedation, tendency to lose efficacy after longer usage, muscle relaxant effect, and high frequency of falls due to gamma-aminobutyric acid effects [1]. Other hypnotics such as zaleplon, eszopiclone, and zolpidem CR are FDA-approved for chronic insomnia, and they are very short-acting. However, they have side effects of over-sedation and losing efficacy [1]. The agent's choice should be based on several factors such as type of complaints (sleep initiation or maintenance), frequency of symptoms, length of treatment, age, and comorbidities of the patient [1].

Conclusion

The treatment of sleeping disorders is dependent on the diagnosis of the disease. The sleeping disorders are classified and categorized into groups of disorders; there are several classification systems. However, the ICSD-3 is the most common classification system. Insomnia is the most frequent sleeping disorder, and it is the first category in the ICSD-3 classification system. Insomnia can be treated with non-pharmacotherapy and pharmacotherapy based on several conditions of the patient and his case.

List of Abbreviations

NREM	Non-rapid eye movement sleep
REMs	rapid eye movements
CR	complete remission
FDA	Food and Drug Administration

Conflict of interest

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