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The impact of narcolepsy symptoms and treatment on sex life - Current Evidence and Reports

Wpływ objawów i leczenia narkolepsji na życie seksualne - aktualne dowody i doniesienia naukowe

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Abstract

Introduction: Narcolepsy (NT) can manifest as excessive daytime sleepiness (EDS), cataplexy, hypnagogic (HHG) and hypnopompic (HHP) hallucinations, sleep paralysis, orgasmolepsy – all of which may affect patients' functioning. The aim of the study was to determine the impact of NT, specific sexual dysfunctions and drugs used in NT on sex life.

Materials and methods: A narrative review was conducted, using keywords: narcolepsy, sexual dysfunctions, medications in narcolepsy from repository inception to March 17, 2024 searching PubMed/MEDLINE, Google Scholar, Crossref, Cochrane databases. The quality of the reviewed articles was assessed using the Scale for the Assessment of Narrative Review Articles (SANRA).

Results: Sexual activity and satisfaction are reduced in up to 81.1% of patients. There are often multiple co-occurring autonomic dysregulations in patients, including the genitourinary system, causing sexual dysfunction (erectile dysfunction in 48% of men; vaginal lubrication in 81% of women). Orgasmolepsy negatively affects sexual and social relationships in more than 1/3 of respondents. Sleep paralysis can be accompanied by HHG, which often present the impression of sexual assault and harassment. They may cause anxiety, post-traumatic stress disorder (PTSD) features, depressed mood, in extreme cases leading to suicide attempts. Of the drugs used in NT, only methylphenidate can increase libido and reduce erectile dysfunction in NT.

Conclusions: Orgasmolepsy, sexual and autonomic dysfunction in NT significantly reduce patients' quality of sex life. Sleep paralysis with sexual HHG can reduce psychological well-being. A holistic intervention approach, using behavioural interventions, cognitive-behavioural therapy, education of the patient and their loved ones, is crucial in the treatment of sexual difficulties.

Keywords: narcolepsy, sexual dysfunctions, medications in narcolepsy

Streszczenie

Wstęp: Narkolepsja (NT) może objawiać się nadmierną sennością w ciągu dnia (excessive daytime sleepiness, EDS), katapleksją, halucynacjami hipnagogicznymi (hypnagogic hallucinations, HHG) i hipnopompicznymi (hypnopompic hallucinations, HHP), paraliżem przysennym, orgazmolepsją, które zaburzają funkcjonowanie pacjentów. Celem pracy jest określenie wpływu NT, współwystępujących specyficznych dysfunkcji seksualnych oraz leków stosowanych w terapii NT na życie seksualne.

Materiały i metody: Przeprowadzono przegląd narracyjny z użyciem słów kluczowych: narkolepsja, dysfunkcje seksualne, leczenie narkolepsji oraz deskryptorów czasowych do 17 marca 2024 r., przeszukując bazy PubMed/MEDLINE, Google Scholar, Crossref, Cochrane. W celu weryfikacji jakości przeglądanych artykułów posłużono się sześciopunktową skalą SANRA (Scale for the Assessment of Narrative Review Articles).

Wyniki: Wykazano, że aktywność i satysfakcja seksualna są obniżone nawet u 81,1% pacjentów. U chorych często współwystępują liczne zaburzenia regulacji autonomicznej, w tym układu moczowo-płciowego, powodując dysfunkcje

seksualne (erekcji - 48% mężczyzn; nawilżenia pochwy - 81% kobiet). Orgazmolepsja negatywnie wpływa na seksualne i społeczne relacje u ponad ⅓ badanych. Paraliżowi przysennemu często towarzyszą nieprzyjemne HHG, które przedstawiają wrażenie napaści i molestowania seksualnego. Mogą powodować lęk, cechy zespołu stresu pourazowego (post-traumatic stress disorder, PTSD), obniżony nastrój, a w skrajnych przypadkach prowadzić do prób samobójczych. Spośród leków stosowanych w NT jedynie metylofenidat może zwiększać libido i zmniejszać zaburzenia erekcji.

Wnioski: Orgazmolepsja, dysfunkcje seksualne i autonomiczne w NT znacząco obniżają jakość życia seksualnego pacjentów. Paraliż przysenny z HHG o charakterze seksualnym często negatywnie wpływają na dobrostan psychiczny. Holistyczne podejście z wykorzystaniem interwencji behawioralnych, terapii poznawczo-behawioralnej, edukacji pacjenta i jego bliskich są kluczowe w leczeniu zaburzeń seksualnych w przebiegu NT.

Słowa kluczowe: narkolepsja, dysfunkcje seksualne, leczenie narkolepsji

Introduction

Narcolepsy is a chronic rare disease that affects sleep architecture [1,2]. It is distinguished into two types, depending on the presence of cataplexy (Narcolepsy type 1; NT1) and lack of that symptom (Narcolepsy type 2; NT2). It is estimated that the frequency of NT2 is 20.5/10,000 and NT1 is 0.02% - 0.18% in the US and Western European populations and 0.16% - 0.18% in the Japanese populations [3]. Narcolepsy is manifested by excessive daytime sleepiness (EDS), hallucinations and sleep paralysis [4]. Cataplexy is a sudden loss of muscle tension during wakefulness caused by especially intense emotions for example anger, excitement, or those leading to laughter. In this state the patient is conscious, but unable to move. It can last from a few seconds to a few minutes [3,5]. EDS consists of daily periods of uncontrollable urge for sleep, which can lead to real sleep attacks [3]. Hallucinations are multimodal or complex visual sensory misperceptions referring to experiences where individuals perceive visual stimuli in a manner that involves multiple senses or complex sensory distortions [6]. Hallucinations in patients with cataplexy are hypnagogic hallucinations (HHG) and hypnopompic hallucinations (HHP) [3,7]. HGH are dream-like hallucinations that appear at the beginning of sleep and can be very terrifying because the patient is not aware of their hallucinatory nature. HPH occurs upon awakening [3]. Hallucinations can also appear during the day [8]. In some patients the dominance of very real hallucinations limits the possibility of recognizing them as unreal [8–10]. Sleep paralysis is often combined with hallucinations. Normal muscle inhibition or atonia occurs during partial wakefulness, either during the period of falling asleep (HHG) or less frequently, during the period of awakening (HHP). This condition is known as "sleep paralysis" [3,11]. These phenomena – cataplexy, hallucinations and sleep paralysis are categorised as REM dissociation phenomena, characterised by the occurrence of REM sleep dreams without concurrent REM phenomena or the loss of muscle tone during wakefulness [4]. One of the first descriptions of narcolepsy with cataplexy originates from German authors Westphal in 1877 [12] and Fisher in 1878 [13]. Theories suggest that narcolepsy is caused by decreased levels of orexin (also known as hypocretin), a neuropeptide involved in regulating alertness [14,15]. In most cases normal concentrations of hypocretin in cerebrospinal fluid (CSF) appear to characterise narcolepsy without cataplexy and narcolepsy with cataplexy is correlated with low concentrations of hypocretin in CSF [14,16,17]. Damage to orexin producing neurons is more limited in NT2 than in NT1 [14,18]. The underlying pathogenesis of NT1 is thought to be due to autoimmune destruction of hypocretin-producing neurons in the hypothalamus; this hypothesis is backed by immune genetic and environmental factors linked to the disease [19–21]. There is evidence that specific genes influence narcolepsy. HLA allele DQB1*0602 is often associated with cases of autoimmune response in NT1, however there are indications that another background related to methylation is also possible [5,22]. Further areas of active research into the causes of narcolepsy include the study of the histamine system, the search for other immune mediators, and the study of “secondary /symptomatic” narcolepsy attributed to damage to the hypothalamus as a result of traumatic, infectious or demyelinating processes [23–25].

Diagnostic criteria for narcolepsy are based on the presence of EDS, REM phase abnormalities on the Multiple Sleep Latency Test (MSLT), cataplexy and hypocretin levels in cerebrospinal fluid. In addition, in type 2 narcolepsy, the presence of other causes of excessive sleepiness and MSLT abnormalities should be excluded [26]. Previous research over the past four decades and across cultures has shown that narcolepsy can have a serious negative impact on the educational, psychosocial well-being, occupational and health-related quality of life (HRQOL) [27–30], even after medical interventions

[31]. Human sexuality is a fundamental universal part of life, and positive sexual relations and sexual function are becoming increasingly recognized as significant markers of quality of life and positive health [32,33]. People with sexual difficulties have lower quality of life compared with healthy people [34,35]. What is the impact of narcolepsy on the sexual life of patients? How does narcolepsy affect that sphere of life?

The aim of the study were:

1) to determine if narcolepsy affects patients' sex life
2) to identify specific sexual dysfunctions in narcolepsy
3) to determine the impact of drugs used in narcolepsy on sex life

Materials and methods

A narrative review of available literature in Polish, English and German was conducted, using keywords: narcolepsy, sexual dysfunctions, medications in narcolepsy, from repository inception to March 17, 2024 searching PubMed/MEDLINE, Google Scholar, Crossref, Cochrane databases. The review was based on information from case reports, original papers and reviews. The quality of the reviewed articles was assessed using the Scale for the Assessment of Narrative Review Articles (SANRA) [36].

Results

For clarity, the review has been divided into the following subsections:

1. Impact of narcolepsy on sex life
2. Specific sexual dysfunction in narcolepsy
3. Impact of drugs used in narcolepsy on sex life

1. Impact of narcolepsy on sex life

According to the study conducted by Heloísa Rovere, Sueli Rossini, Rubens Reimão with usage of WHOQOL-BREF on 40 Brazilian narcoleptics, social relations domain, which includes sexual activity, is lower than in general population [37]. In a survey study conducted by Davidson et al. most of 254 narcoleptic participants stated that narcolepsy impacts their sex life (81.1%). Sleepiness may be the most significant cause of psychosocial disability in narcoleptic patients and can lead to sexual problems [38,39]. Sleep attacks, which occur even in 53.2% of narcoleptic patients, can as well impact sexual life in a significant level [40,41]. It is also important to assess the severity of the impact of narcolepsy on sexual dysfunction. Kapella et al. surveyed 120 narcoleptic patients, who rated their sexual life on a 5-point Likert scale with 0=extreme difficulty to 4= little problem. The average score was 3.0+/-0.8 [42]. In a study conducted by Alaia on 95 narcoleptics, 36% reported that their disease was associated with decrease of quality in sexual life. Impotence was the most common sexual problem in men. When it comes to 15.8% of participants, they described the impact of their symptoms on the quality of their sexual life as significantly adverse. Participants provided ratings for overall sexual satisfaction using a 5-point scale, ranging from 1 (not satisfied) to 5 (very satisfied). The average score was 3.1, with a standard deviation of 1.58. A positive correlation was observed between the interpersonal relationship subscale and the sexual satisfaction scale. This indicates that individuals in supportive intimate relationships tend to report higher levels of sexual satisfaction [43]. The primary neuropathological alteration in narcolepsy involves the specific and permanent degeneration of neurons that produce hypocretin neuropeptide precursor (HCRT) in the lateral hypothalamus [44]. Individuals with NT1 frequently exhibit reduced levels of HCRT in their CSF. These hypocretin neurons project widely to various regions of the brainstem, influencing alterations in the autonomic nervous system [45]. Nevertheless, autonomic symptoms are often overlooked in comparison to the more characteristic symptoms observed in NT1 [46]. Through various assessments, such as microneurography and ambulatory blood pressure monitoring, multiple human studies have identified abnormal sympathetic activation in drug-free narcoleptic patients [47–49]. Therefore, patients with narcolepsy also often have autonomic disorders of the gastrointestinal, cardiovascular, urinary and reproductive systems, as well as dysfunction of thermoregulation and pupil reactivity. Lucie Barateau et al. assessed the severity of the above disorders with the SCOPA-AUT scale in 92 NT1 patients (not taking medication) and 109 healthy people (control group). Results of a study report that sexual dysfunction has been documented in 48% of men, primarily characterised by erection problems, and in 81% of women, primarily marked by issues related to vaginal lubrication. Also, NT1 patients were significantly more likely to report autonomic dysfunctions of other specific body systems than the control group [50]. Joshi et al. demonstrated the involvement of HCRT receptors in sex hormone synthesis by reducing serum testosterone levels in adult mice through the injection of an HCRT receptor antagonist [51]. In another study comparing serum gonadotropin levels in males with NT1, diminished pulsatile luteinizing hormone release was observed compared to controls, suggesting the involvement of HCRT in regulating hypothalamic-pituitary-gonadal axis activity. The study group also had reduced levels of orexin and normal gonadal hormone concentrations in plasma [52]. Biobaku et al. presented a case report of a secondary narcolepsy due to a low level of testosterone [24]. Furthermore, inadequate testosterone levels and aberrant hypothalamic-pituitary-gonadal axis functioning may contribute to male sexual dysfunction. Hypocretin is actively involved in the regulation of the

dopaminergic system, which is crucial for motor control, but also in promoting wakefulness, in sexual behaviour and reward mechanism [39,53]. Karacan suggests that alterations in the sympathetic-parasympathetic balance linked to sleepiness may impact erectile function mediated by the autonomic nervous system. Other causes could be a greater prevalence of non-insulin-dependent diabetes (NIDD) among patients with narcolepsy. Diabetes could lead to neurogenic and vascular dysfunction that could cause erectile dysfunction. Another theory stated by Karacan is based on evidence that narcoleptic patients have impaired dopamine metabolism, which could lead to erectile dysfunction [41].

2. Specific sexual dysfunction in narcolepsy

2.1. Orgasmolepsy

Cataplexy that occurs during orgasm and sexual intercourse was described for the first time and defined ''orgasmolepsy'' by Jakob Rothfield in 1928 [54]. Davidson et al. reported experiences of catalepsy during sex by almost one third of respondents, while 53.2% of patients fell asleep during intercourse. When it comes to 36.6% of the patients who experienced the above situations, they felt that it negatively affected their sexual activity [40]. Orgasmolepsy might be masked by other sexual disorders, which are commonly observed among NT1 patients as part of a dysautonomic syndrome [50]. However, the onset of an active sexual life may coincide with ongoing effective treatments for cataplexy in individuals with narcolepsy, thus preventing the occurrence of orgasmolepsy [50,55]. Patients experienced orgasmolepsy with their partners within stable relationships, implying that emotional disinhibition and reduced self-control may necessitate a state of intimacy as a precondition for orgasmolepsy. Studies have shown deactivation in the prefrontal cortex, responsible for self-control, during sexual arousal and orgasm, indicating the presence of emotional disinhibition [56,57]. Poryazova et al. propose that orgasmolepsy could be linked to continued amygdala firing during sexual intercourse, leading to the disinhibition of neurons responsible for generating muscle atonia in the pontine and medullary regions [39]. Other theories suggest involvement of hypocretin and dopaminergic systems in pathophysiology of orgasmolepsy [17,58–61]. It should be noted that orgasmolepsy effects on sexual function can have a significant impact on the patient's relationships and emotional well-being [55].

2.2. Sleep paralysis and sexual hallucinations

In general, 83% of narcolepsy patients indicated experiencing confusion between dreams and reality, in contrast to a mere 15% of individuals in the control group who reported similar experiences. Dream delusions could potentially represent merely one facet of a broader memory impairment observed in individuals with this disorder. There is a possibility that due to subjective memory difficulties they can confuse other people's stories as their memories. The inability to differentiate memories formed during sleep from those occurring during wakefulness may directly result from the well-documented neural mechanisms associated with narcolepsy. E. Wemsley et al. speculate that disruption of the orexin system present in narcolepsy may lead to the occurrence of dream delusions, since orexin neurons primarily targets monoaminergic and cholinergic neurons responsible for regulating sleep states. This connection underscores their significance in the control of sleep-wake cycles and it can disrupt encoding of dreams as memories [62]. Sleep paralysis is often accompanied by HHG, which resembles dreams and occurs during the period of falling asleep [11]. Sleep paralysis and HHG are products of "sleep-onset REM" (SOREMP), a REM stage that occurs earlier than normal when the patient is still partially conscious [4,11]. The emotional experience of sleep paralysis with hallucinations often involves fear, terror, and panic. Elements such as threatening presences, vulnerability while paralyzed, and uncontrollable visions contribute to intense, predominantly dysphoric, negative emotions. Some aspects of spontaneous thoughts during sleep paralysis can be interpreted as paranoid delusions [63,64]. These disorders profoundly affect social and sexual life and psychological well-being [65,66]. Impression of the presence of malevolent intruders in the bedroom, and physical/sexual assaults are common hallucination themes in sleep paralysis [62,63,67,68]. In a series of case reports by Hays, a 42-year-old woman claimed that she was sexually assaulted multiple times. According to investigators, it turns out to be probably hallucinations due to the onset of narcolepsy, that led the patient to false but sincere belief that she was assaulted. Another patient presented by Hays was 31 years old women with unrecognized narcolepsy, who had hallucinations that reduced her quality of life to such an extent that she attempted suicide. She had hallucinations that she was assaulted sexually. Several other cases similar to that are described by Hays [10]. Female patient claimed that she was sexually assaulted, she had a vivid recollection of this event and could present a detailed description of it. She reported it to the police. Investigation revealed that during the attack, she was seen in public space, sitting quietly. After a few hours, she realised the experience was not real. Treatment with 200 mg of modafinil per day decreased her sleepiness and 50 mg of clomipramine per day reduced her hallucinations to none [38]. Tjokrodipo L, Sneep A, Michielsen presented a case report of a patient with sleep paralysis and sexual hallucinations.

The patient was also diagnosed with psychotic disorders, intellectual disability (IQ=74) and complications of cannabis use. During sleep paralysis, the patient experienced hallucinations of sexual intercourse with caregivers and the perception that a woman was sitting on his chest [69]. In a study reported by McNally and Clancy involving people who reported alien encounters, three participants experienced sleep paralysis with perceptions of sexual harassment by aliens. One of them showed some symptoms of past post-traumatic stress disorder (PTSD) after the incident [70]. Also a 24-year-old female patient with narcolepsy without cataplexy presented with visual HHG. She experienced episodes where she felt immobilized in bed, attempting to awaken but encountering dream hallucinations of sexual assault. The patient was treated with modafinil and antidepressants, leading to a reduction in hallucinations and improved daytime alertness [71]. Survivors of sexual assault often encounter various sexual difficulties post-assault, such as sexual dysfunction, diminished sexual satisfaction, fear of sexual intercourse [72]. For patients with narcolepsy nightmares, sexual hallucinations during sleep paralysis can be seen as real incidents. Sexual hallucinations also sometimes led to discontinuation of sexual intercourse. A case of a 46-year-old male patient, with a history of EDS, cataplexy, sleep paralysis, and HHG, was described by A. Moszczynski and F. Coelho. He experienced sporadic HHG episodes throughout the day, with frequent occurrences during the night. He revealed that his sexual HHG had been disrupting his sexual relations with his wife for the past six years. During these sexual HHG episodes, he described observing himself and his wife in action, akin to an out-of-body experience (OBE), accompanied by a sensation of floating. Treatment with methylphenidate and amitriptyline completely resolved the sexual HHG, although residual EDS persisted. Methylphenidate was subsequently substituted with modafinil, resulting in improved daytime alertness [73]. A 45-year-old patient with unrecognised narcolepsy with daytime sleepiness, sleep attacks, cataplexy and hallucinations had a vivid memory of sexual intercourse with his boss's wife. It led to severe conflict with his chief. Reaction of his colleagues convinced him that experience may not be true. He was diagnosed with narcolepsy and treated with 200 mg of modafinil and 50 mg of clomipramine per day, which led to decrease of his sleepiness and disappearance of hallucinations and delusions [38].

3. Impact of drugs used in narcolepsy on sex life

A survey study conducted by Teixeira VG, Faccenda JF, Douglas NJ in 2004 on patients with NT1 (n=49) showed that 41% of them had experienced sexual difficulties. Patients were on treatment with either stimulant medication, a combination of stimulant and anti-cataplexy agent or using only an anti-cataplexy agent. Three patients were taking no medication [74]. In a survey study conducted by Davidson et al. on 254 narcoleptic participants, among participants with NT1, the usage of drugs known to affect sexual function (selective serotonin reuptake inhibitors / tricyclic drugs) was not correlated with differences in effects on sexual life [40]. The effects of medications on autonomic symptoms in patients with NT1 were assessed. Upon individual analysis of each item of the questionnaire, a deterioration in sexual dysfunction was observed in men exclusively, particularly ejaculation problems. Among those under medication, 42.9% reported such symptoms, compared to 21.9% without treatment [50]. Modafinil, armodafinil, and solriamfetol are medications used to treat EDS [53]. The mechanism of action of modafinil is intricate and unique compared to other wakefulness-promoting medications. It regulates glutamate, GABA, histamine, and hypocretin, and to a lesser extent, the monoaminergic systems [75]. Studies have demonstrated that dopaminergic D1 and D2 receptors play a crucial role in mediating the arousal effects of modafinil [76]. Diminished libido is also a rare adverse reaction linked to modafinil [77]. Methylphenidate can increase libido and reduce erectile dysfunction [78]. It increases norepinephrine and dopamine transmission [79]. In a case report presented by Gregory Bierer, a 20-year-old patient with narcolepsy with cataplexy was firstly treated with 200 mg of modafinil. He reported tremor and agitation and erectile dysfunction, after that he was prescribed with armodafinil, but he experienced the same side effects. His treatment was changed to methylphenidate hydrochloride 10 mg at 8 am and 10 mg at noon if needed. Patient found this treatment to be effective for him. On the methylphenidate regimen he has not experienced cataplexy for 6 months [80]. Antidepressants are mainly treatment for cataplexy [53]. Moreover, almost all antidepressants employed in the management of cataplexy in individuals with NT1 are recognized for their potential side effects, including reduced libido, erectile dysfunction, delayed orgasm or anorgasmia, and delayed ejaculation [81]. The therapeutic effect of antidepressants on cataplexy primarily involves the inhibition of adrenergic uptake, whereas serotonin uptake blockers are comparatively less effective [82]. Pitolisant is histamine H3 receptor antagonist/inverse agonist [83], and is approved by the European Medicines Agency (EMA) for treatment of cataplexy and EDS [84]. Increased and decreased libido are not very common side effects of pitolisant [83]. Sodium oxybate is effective in addressing EDS, cataplexy, and fragmented nocturnal sleep [53]. Sodium oxybate potentially operates through $GABA^{B}$ receptors or its specific receptors, alongside

potential modulation of dopaminergic neurotransmission [85].

Conclusion

Narcolepsy is a rare sleep disorder. According to studies, narcoleptic patients claim that narcolepsy has a negative impact on their quality of life, social life and sexual life [10,34,35,40]. Various studies reported numerous autonomic alterations in patients with narcolepsy, like impotence and problems with vaginal lubrication, which are associated with deficiency of hypocretin [44–47,50]. Other studies suggest that low level of hypocretin can cause sexual dysfunction through alterations in testosterone levels and dopaminergic system [24,39,52,53]. Karacan suggested that greater prevalence of non-insulin-dependent diabetes (NIDD) among patients with narcolepsy may also be the cause of erectile dysfunction as a complication of diabetes [41]. Other possible explanations of narcolepsy impact on sexual life are secondary impact of symptoms of the disease. One of these disorders is orgasmolepsy, which may be underreported due to the embarrassment, effectiveness of treatment, or it might be masked by other sexual disorders [39,40,50,55]. Studies suggest alterations in amygdala, as an explanation for the occurrence of orgasmolepsy [39] or involvement of dopaminergic and orexin systems [58–61,86]. This aspect of narcolepsy's effect on sexual function can have a significant impact on the patient's relationships, emotional well-being and sexual life [41,55]. Honest conversation with a sexual partner may be helpful for easing the distress following this symptom [40]. Pitolisant and sodium oxybate seem to be effective treatments for this symptom in some cases [39,55]. In some patients dreams delusions occur as nightmares and are very terrifying and vivid, with aggressive content like sexual assaults, which some patients interpret as real memories, what can affect psychosocial well-being [62]. Some narcoleptic patients experience hallucinations or sleep paralysis with hallucinations of being sexually assaulted, which can profoundly affect social life and psychological well-being or cause suicide attempts [62–66,73]. Also in some cases it may lead to development of severe stress and occurrence of some symptoms of PTSD [70]. In most cases hallucinations can be treated with stimulants [10,71,73]. Medical providers should ask clear, concrete and direct questions, maintaining non-judgmental, when asking the social life of a narcoleptic patient. There is an increasing interest in developing behavioural interventions aimed at enhancing the quality of life for people with narcolepsy [40]. One method is to schedule naps during the day. Typically, they last from 15 to 20 minutes. At the same time, it is recommended to extend nocturnal sleep. In addition, physical activity can have a positive impact [79]. Lack of understanding for symptoms of narcolepsy is common. Open communications through meeting with psychologists could lead to building an understanding and solution for sexual problems [40]. The recommended therapy is cognitive behavioural therapy (CBT). The patient learns to notice and modify disturbances in his or her way of thinking and acting. This improves adherence to medication, as well as the patient's functioning and quality of sex life [79]. After a diagnosis of narcolepsy is established, mere prescription of medication is insufficient. Continuous support and counselling for patients are imperative. Educating the patient, their family, and potentially their employer is necessary to alleviate social pressures on these individuals. While support groups for narcoleptics and their families can be beneficial, they have yielded mixed results. Without informed guidance, some groups have disseminated inaccurate information and ineffective therapies. Involvement of sleep professionals is crucial for these support groups to be truly effective [43]. Medications commonly used to manage symptoms of narcolepsy, such as antidepressants and stimulants, including imipramine, clomipramine, fluoxetine, citalopram, dextroamphetamine, phenelzine, and others, have been consistently associated with sexual symptoms. This includes difficulties achieving or maintaining erections, reduced libido, premature ejaculation, and delayed orgasm [50,74,79–81]. Methylphenidate seems to have a positive impact on libido and erectile function [78,80]. There is a speculation that timing sexual activity when drug levels are lower in the morning may reduce interference with sexual function and result in better quality erections. However, formal clinical trials to validate this notion are lacking [41]. A multidisciplinary approach that combines aspects of patient and his family education, as well as behavioural therapy, is important in the treatment of sexual dysfunction in narcolepsy [40,79].

Conflict of interest

The authors have declared no conflict of interest.

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