

Sleep Disorders in Women: What Should a Gynecologist Know?

Schlafstörungen bei Frauen: Was sollte ein Gynäkologe wissen?



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ABSTRACT

Women often face sleep disturbances during key life stages such as adolescence, pregnancy, postpartum period, and perimenopause, influenced by hormonal fluctuations and conditions like polycystic ovary syndrome (PCOS) and premenstrual syndrome (PMS). The goal is to explore women's sleep dis-

orders as classified in the International Classification of Sleep Disorders-3 (ICSD-3). Through a literature review, this study assesses the management of sleep disorders in women, particularly focusing on the link between gynecological disease and sleep disorders. It scrutinizes landmark research in diagnosing and treating women's sleep disorders. Observations indicate that physiological changes during adolescence, pregnancy, postpartum, and perimenopause can cause sleep issues, commonly addressed by gynecologists. Conditions like PCOS and PMS are notably linked to increased sleep disorder occurrences. The conclusion underscores the importance of gynecologists' awareness of the heightened risk of sleep disturbances in women, who often present these issues during consultations.

ZUSAMMENFASSUNG

In wichtigen Lebensabschnitten wie Adoleszenz, Schwangerschaft, Kindbett und Perimenopause werden Frauen oft mit Schlafstörungen konfrontiert, die durch Hormonschwankungen und Krankheiten wie polyzystisches Ovarsyndrom (PCOS) und prämenstruelles Syndrom (PMS) hervorgerufen werden. Das Ziel war, Schlafstörungen, die in der Internationalen Klassifikation von Schlafstörungen (ICSD-3) aufgeführt sind, bei Frauen zu erforschen. Mithilfe eines Literaturüberblicks bewertet diese Studie das Management von Schlafstörungen bei Frauen und richtet ein besonderes Augenmerk auf den Zusammenhang zwischen gynäkologischen Erkrankungen und Schlafstörungen. Wegweisende Studien zur Diagnose und Behandlung von Schlafstörungen bei Frauen wurden untersucht. Alle Beobachtungen deuten darauf hin, dass physiologische Veränderungen in der Adoleszenz, in der Schwangerschaft, im Kindbett und in der Perimenopause zu Schlafstörungen führen können, mit denen sich Gynäkolog*innen oft befassen müssen. Krankheiten wie PCOS und PMS sind bekanntlich mit einem erhöhten Auftreten von Schlafstörungen verbunden. Die Schlussfolgerung hebt hervor, wie wichtig es ist, dass sich Gynäkolog*innen das höhere Risiko von Schlafstörungen bei Frauen bewusst sind, da Frauen dieses Problem oft während der Untersuchung ansprechen.

Introduction

Sleep issues affect roughly 35% of people, presenting challenges with initiating or maintaining sleep, or experiencing non-restorative sleep, significantly impacting daily functioning [1]. The American Psychiatric Association defines sleep or sleep-wake disorders as conditions that affect sleep quality, timing, and quantity, leading to daytime impairment [2]. It is widely acknowledged, by nearly 97% of psychiatrists, that evaluating sleep disorders is crucial during initial psychiatric assessments due to their potential connection with emotional or medical conditions [2]. Such disorders are linked to several factors including aging, chronic diseases, obesity, depression, and physiological changes like menopause and pregnancy, all of which can deteriorate sleep quality and quantity, especially a reduction in NREM and REM sleep phases [3].

Notably, women are twice as likely as men to experience sleep disorders, a disparity influenced by hormonal fluctuations and changes associated with menstrual cycles, pregnancy, adolescence, and perimenopause [3, 4, 5]. These conditions not only degrade sleep quality but also contribute to broader economic and social impacts through reduced productivity, increased healthcare costs, and elevated risk of accidents [1, 6]. Furthermore, sleep disorders can diminish quality of life by fostering daytime fatigue, irritability, and susceptibility to chronic diseases like diabetes and cardiovascular disease [7, 8, 9]. In older adults, poor sleep quality increases the risk of falls and related complications, highlighting the need for careful management of sleep health across all ages [6].

Despite the higher incidence of sleep complaints among women, research has predominantly focused on men, overlooking gender-specific factors [10]. However, studies such as the meta-analysis by Ohayon et al. have begun to address this gap, comparing sleep patterns across genders and identifying both similarities and distinct differences in how aging affects sleep disorders in men and women [11].

Sleep is a fundamental physiological process, and its role extends beyond mere rest. It is essential for cognitive function, emotional regulation, and overall health. Physiological changes in sleep patterns occur with aging, with implications for both sleep quality and health outcomes. Poor or unrefreshing sleep is linked to a range of negative health outcomes, underscoring the clinical importance of understanding and addressing sleep disorders across all ages [12]. This review highlights the critical aspects of sleep, particularly focusing on changes throughout life stages, and emphasizes the need for healthcare professionals to assess and manage sleep issues proactively.

Sleep Patterns in Women from Infancy to Aging

Research indicates that sleep patterns in women are influenced by both intrinsic factors like circadian and endocrinological changes and extrinsic factors such as psychosocial elements from infancy through aging. Studies reveal that male and female newborns exhibit differences in electrocortical activity and sleep arousal, although these distinctions often diminish over time and remain

► **Table 1** Classification of Sleep Disorders in ICSD-3 Classification [1].

Sleep Disorders (ICSD-3 Classification)
<ul style="list-style-type: none"> ▪ Insomnia
<ul style="list-style-type: none"> ▪ Sleep-related breathing disorders
<ul style="list-style-type: none"> ▪ Central Disorders of Hypersomnolence
<ul style="list-style-type: none"> ▪ Circadian Rhythm Sleep-wake Disorders
<ul style="list-style-type: none"> ▪ Parasomnias
<ul style="list-style-type: none"> ▪ Sleep-related Movement Disorders
<ul style="list-style-type: none"> ▪ Other Sleep Disorders
ICSD = International Classification of Sleep Disorders

inconsistent during infancy and childhood [10, 11]. The onset of puberty marks significant sex-related changes in sleep patterns, largely due to increases in sex steroids, which can affect the circadian timing system and contribute to the development of sleep disorders such as insomnia [13, 14, 15]. Women, for example, display different estrogen receptor expressions and melatonin levels compared to men, impacting their sleep-wake cycles [16]. Moreover, sleep disturbances become more prevalent during the perimenopausal period, with a reported incidence of 40–60% among menopausal women [17, 18]. This study aims to delve into sleep disorders in women as classified by the ICSD-3 [19] (► **Table 1**).

Insomnia

Insomnia, defined as difficulty falling or staying asleep, is a prevalent sleep disorder affecting more than one-third of adults at some point, with a significant portion developing chronic conditions [20]. The underlying mechanisms of insomnia are multifaceted, involving behavioral, cognitive, emotional, and genetic factors [21]. In particular, adolescent girls exhibit a higher prevalence of insomnia following puberty, emphasizing the impact of hormonal changes and psychological stressors [22, 23, 24, 25]. This trend continues into adulthood, where women report higher rates of insomnia, often attributed to physiological changes and hormonal fluctuations during menstrual cycles, pregnancy, and menopause [26, 27, 28].

Hormonal fluctuations during pre-menopause, menopause, and post-menopause can significantly disrupt sleep patterns, leading to shortened sleep duration and increased nighttime awakenings [29, 30]. The effects of hormones like estrogen and progesterone on sleep are critical to understanding and managing insomnia among women. Similarly, during other critical life stages such as adolescence and reproductive years, hormonal changes can exacerbate sleep disturbances [31]. For instance, hormonal fluctuations during different phases of the menstrual cycle can induce sleep problems, particularly pronounced during the luteal phase when progesterone levels rise [32].

In clinical practice, addressing insomnia involves a detailed evaluation of the patient's hormonal profile and, if necessary, an endocrinological assessment. Effective treatment approaches include cognitive behavioral therapy (CBT) and pharmacological interventions, which focus not only on sleep issues but also on comorbid conditions such as anxiety or depression [33, 34]. Ensuring that current guidelines and treatment protocols for sleep disorders consider these hormonal interactions is vital. This integrated approach can significantly improve the management of insomnia, enabling healthcare providers to offer more targeted interventions and ultimately enhancing the quality of life for patients.

Sleep-related Breathing Disorders

Sleep-related breathing disorders (SRBDs), including obstructive sleep apnea (OSA), are characterized by interruptions in breathing during sleep. OSA prevalence is significant among adults, especially women with conditions like polycystic ovary syndrome (PCOS), where up to 35% may experience OSA compared to 9–38% in the general population [35, 36]. Metabolic syndrome components in PCOS patients notably influence sleep disorders, with treatments ranging from conservative approaches to CPAP for obstructive sleep apnea [37, 38, 39].

Central Disorder of Hypersomnolence

Central disorders of hypersomnolence, a condition characterized by increased daytime sleepiness, has a known pathophysiology linked to hypocretin deficiency and is associated with an increased risk of premature puberty [40, 41]. These aspects are particularly relevant for gynecologists and should be highlighted, correcting the earlier assertion that the pathophysiology of conditions involving increased daytime sleepiness is not known.

This compact synthesis provides a concise overview of the key points from the original sections, incorporating references directly to maintain academic integrity while ensuring readability.

Circadian-Rhythm Wake Sleep Disorders

Circadian-Rhythm Wake Sleep Disorders: The endogenous circadian rhythm, crucial for controlling sleep, involves physiological processes such as cortisol and melatonin secretion, body temperature changes, and urine volume variations. Menstrual and circadian rhythms interact, with circadian changes occurring in response to the menstrual cycle phase in women. Disrupted circadian rhythms are linked to menstrual irregularities and disorders. Factors like shift work or increased nighttime light exposure can increase breast cancer risk in women. Polysomnographic studies generally find stable sleep continuity and efficiency across different stages of the ovulatory menstrual cycle in young, healthy women [42, 43]. Sleep homeostasis is maintained throughout the menstrual cycle [44], with REM sleep slightly affected during the menstrual phase. Studies suggest REM sleep onset is earlier and the percentage of REM sleep decreases with increased body temperature during the luteal phase [45, 46]. The luteal phase also sees increased daytime sleepiness and naps, indicating a greater need for slow-wave sleep (SWS) [47]. ▶ **Fig. 1** in our review illus-

trates the complicated dynamics between hormonal fluctuations and their effects on sleep behavior during the menstrual cycle. This figure summarizes findings from seminal work in this field, particularly that of Pengo et al. (2018) and the comprehensive review by Haufe et al. [32, 48]. Pengo et al. discuss the nuanced role of estrogen and progesterone in sleep regulation, highlighting in particular the increased sleep disturbances during the luteal phase when progesterone levels peak. Similarly, the Haufe et al. review further elaborates on how these hormonal elevations disrupt sleep quality, increase nighttime awakenings and increase daytime sleepiness. Together, these studies provide an important foundation for our understanding of the interactions between sleep and hormones, as illustrated in ▶ **Fig. 1**, and emphasize the importance of hormonal considerations in the clinical management of sleep disorders in women. Women aged 18–50 report more sleep disturbances premenstrually and during the initial days of menstruation [49, 50]. Even young women with ovulatory cycles and no menstrual complaints experience poorer sleep quality premenstrually and during menstruation's first four days [49]. These changes are more pronounced in PMS and premenstrual dysphoric disorder (PMDD). Hormonal variations of the menstrual cycle affect sleep EEG, with a significant increase in sleep spindle frequency activity during the luteal phase, suggesting an interaction between endogenous progesterone metabolites and GABA-A membrane receptors [44, 51]. Current studies show that while subjective sleep quality is lowest before and during menstruation, sleep timing and composition remain relatively constant throughout the menstrual cycle, except for an increase in spindle frequency activity and a minor decrease in REM sleep during the luteal phase in healthy women. Research has explored phototherapy and melatonin for treatment, though evidence for chronotherapy's efficacy remains limited by the lack of randomized controlled studies [52].

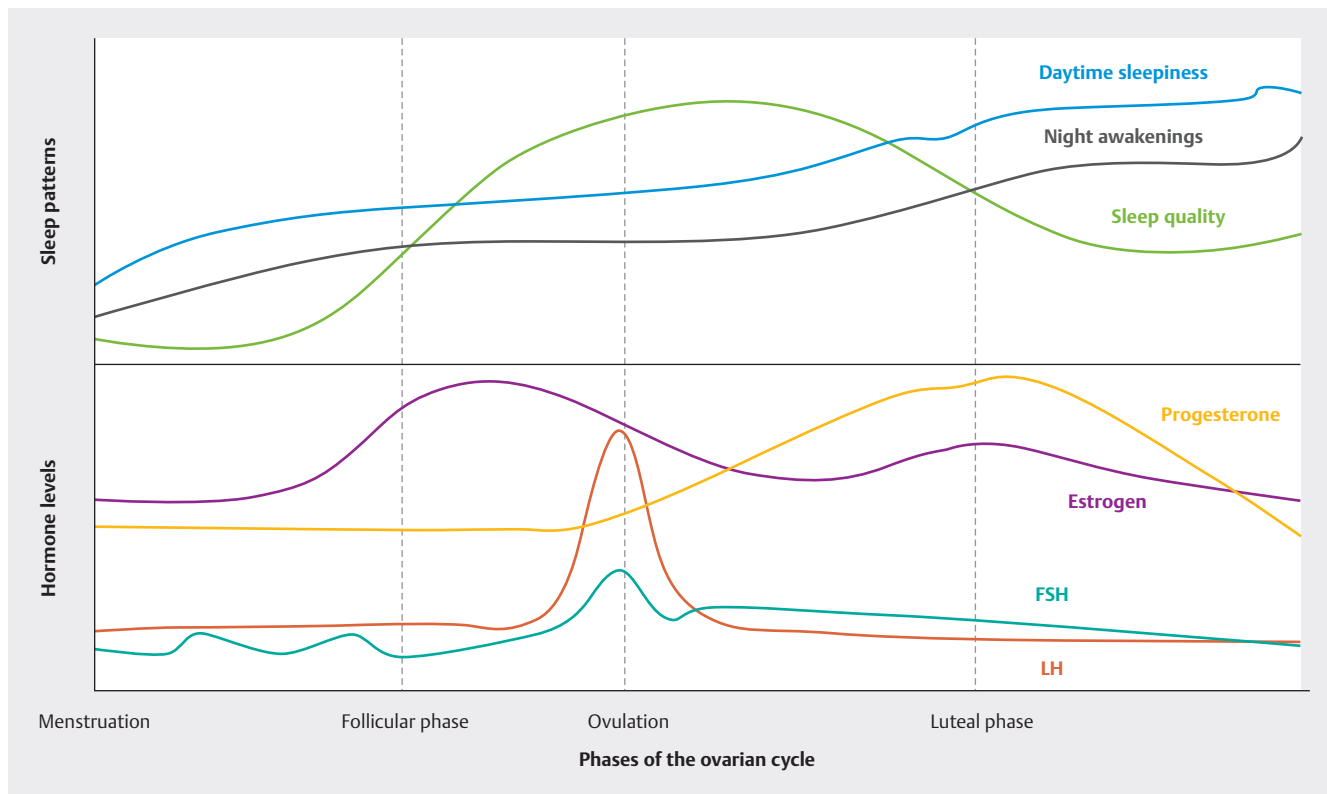
Parasomnias

These sleep disorders are characterized by abnormal movements, behaviors, emotions, and perceptions occurring at different sleep stages. There is no randomized controlled study demonstrating a direct link between parasomnias and gynecological disorders.

Sleep-related Movement Disorders

Sleep-related movement disorders encompass a range of conditions manifesting as simple, typically repetitive movements during sleep. Key disorders classified under this category in the International Classification of Sleep Disorders, Third Edition (ICSD-3), include Restless Legs Syndrome (RLS), periodic limb movement disorder, sleep-related leg cramps, sleep-related bruxism, sleep-related rhythmic movement disorder, benign sleep myoclonus of infancy, propiospinal myoclonus at sleep onset, and sleep-related movement disorders due to medications or substances. RLS is notable for causing dysesthesias while awake, alongside recurrent limb movements in sleep.

RLS, also known as Willis-Ekbom Disease, is a neurological disorder characterized by an urge to move the legs, often accompanied by uncomfortable sensations [53]. The general population



► **Fig. 1** Hormonal fluctuations and sleep patterns across the menstrual cycle. This figure illustrates the changes in hormone levels of follicle-stimulating hormone (FSH), luteinizing hormone (LH), progesterone, and estrogen across the menstrual cycle, and their correlation with sleep quality, night awakenings, and daytime sleepiness. The phases of the menstrual cycle are marked as menstruation, follicular phase, ovulation, and luteal phase. Notably, sleep disturbances increase with rising progesterone levels during the luteal phase.

shows a 1.9% to 15% prevalence rate for RLS, with studies highlighting a significant prevalence among adult females [54]. RLS sufferers experience uncomfortable sensations in the limbs, often worsening at rest and at night, which can be somewhat alleviated by movement. These sensations can be described variably, from “creeping” to “tingling” or even as indescribable discomfort, potentially spreading to the arms or trunk as the condition progresses. RLS prevalence increases with age and is more common among women, with many patients reporting a family history of the disorder [55].

The gender disparity in RLS prevalence is thought to be influenced by sex hormones and physiological states such as pregnancy and iron deficiency. Hormonal fluctuations during the menstrual cycle, pregnancy, and menopause in women are hypothesized to contribute to this disparity, though evidence on hormonal roles remains mixed and unproven [56]. Interestingly, no significant gender differences have been noted in the duration of RLS, family history incidence, weekly frequency of symptoms, or daytime sleepiness severity [47]. Secondary RLS, often linked to neurological disorders, iron deficiency, or pregnancy, generally emerges later in life. Approximately 20% of pregnant women experience RLS, with symptoms ranging from moderate to severe [57].

The hormonal impact hypothesis on RLS during pregnancy is supported by increases in estrogen, progesterone, and prolactin

levels, although not all pregnant women develop RLS, indicating that hormones might interact with other factors, such as neurotransmitters like dopamine, to influence RLS [53]. Hormone replacement therapy (HRT) during menopause has not shown to alter the prevalence of RLS or reverse age-related sleep changes in women [58]. Similarly, RLS prevalence does not differ significantly among transgender individuals undergoing hormone therapy [59].

The role of iron during pregnancy is critical in understanding and effectively managing RLS. During pregnancy, the increased iron demand due to the growing needs of the fetus and placenta, along with the increased maternal blood volume, is a proven major factor for RLS in pregnant women. Iron deficiency is not only a risk factor for RLS but also for other pregnancy-related complications such as anemia, which can exacerbate RLS symptoms [60, 61].

A meta-analysis conducted by Chen et al. (2017) revealed that the prevalence of RLS in pregnant women is significantly higher compared to the general population, with an average prevalence rate of 21% across all three trimesters. This prevalence increases as pregnancy progresses, reaching up to 22% in the third trimester [62].

Therefore, pregnant women should be routinely screened for iron status and supplemented with iron as necessary. The guidelines developed by the German Society for Neurology and the German Society for Sleep Research and Sleep Medicine suggest initiating iron supplementation if serum ferritin levels fall below

► **Table 2** Common sleep disorders related to gynecological situations.

Condition	Gynecological Situations	Defining Features	Confirmatory Evaluations	Treatment
Insomnia	<ol style="list-style-type: none"> 1. Adolescents 2. Menopause or transition to Menopause 3. Premenstrual syndrome/Premenstrual dysphoric disorder 	<ol style="list-style-type: none"> a) Difficulty with: <ol style="list-style-type: none"> 1. Sleep initiation or 2. Sleep maintenance b) Results in: <ol style="list-style-type: none"> 1. Fatigue/malaise 2. Mood disturbance/irritability 3. Reduced productivity 	<ol style="list-style-type: none"> 1. Primary: clinical history 2. Ancillary: sleep diary 	<ol style="list-style-type: none"> a) Non-pharmacological: <ol style="list-style-type: none"> 1. Cognitive behavior therapy b) Pharmacological: <ol style="list-style-type: none"> 1. Hypnotics 2. Antidepressants 3. Melatonin agonists 4. Orexin antagonists
Sleep related-Breathing Disorders	<ol style="list-style-type: none"> 1. Polycystic ovary syndrome 	<ol style="list-style-type: none"> 1. Snoring/apneas/gasping upon awakening 2. Other nonspecific symptoms <ul style="list-style-type: none"> – Attention deficits – Morning headache – Mood disturbance – Nocturia, night sweats 	<ol style="list-style-type: none"> 1. Home sleep testing 2. Polysomnography in both cases, diagnosis requires: Apnea-Hypopnea Index >5/h with symptoms or Index >15/h regardless of symptoms 	<ol style="list-style-type: none"> 1. Continuous or bilevel positive airway pressure 2. Sleep position 3. Weight loss 4. Avoidance of “relaxants” close to bedtime
Circadian-Rhythm Wake Sleep Disorders	Before and during menstruation	<ol style="list-style-type: none"> 1. Sleep occurs systematically earlier or later than needed 2. Sleep length is normal and the patient is refreshed when sleeping according to his/her desired time 	<ol style="list-style-type: none"> 1. Sleep diary 2. Electroencephalogram 3. Melatonin 	<ol style="list-style-type: none"> 1. Melatonin 2. Combined with morning blue light
Sleep Related – Movement Disorder	<ol style="list-style-type: none"> 1. Alterations in sex hormones 2. Iron deficiency 	<ol style="list-style-type: none"> 1. Uncomfortable sensations that cause the patient to move their limbs. 2. Difficulty initiating sleep due to uncomfortable feelings and urge to move 3. Interrupted sleep, discomfort 4. Daytime sleepiness 	<ol style="list-style-type: none"> 1. Clinical history 2. Polysomnography 3. Periodic limb movement of sleep >15/h with symptoms 	<ol style="list-style-type: none"> 1. Dopamine-agonists <ul style="list-style-type: none"> – Pramipexole – Ropinirole The dose of dopamine agonists should be kept low 2. Gabapentin, enacarbil 3. Fe supplementation if indicated (ferritin <70 µg/l to be continued until >100 µg/l, or transferrin saturation dips under 20%)

75 µg/L or transferrin saturation dips under 20% (► **Table 2**). Oral iron supplements should be taken with vitamin C to enhance absorption and should not be consumed with milk, tea, or coffee, which can interfere with iron uptake. In cases where oral supplementation fails or is not tolerated, intravenous iron treatment is recommended, administered in a clinical setting with close monitoring to prevent any potential allergic reactions and avoid iron overload. The approach underscores the critical role of iron in managing RLS, promoting a regimen tailored to individual patient needs based on ongoing monitoring of iron levels [63, 64]. In cases of severe deficiency or poor tolerance to oral iron, intravenous iron formulations like ferric carboxymaltose may be considered. Regular monitoring of serum ferritin and iron levels is essential to ensure they remain within the target range. Lifestyle modifications, including regular exercise and proper sleep hygiene, can also play a supportive role in managing RLS during pregnancy.

The dopaminergic system’s dysfunction is suggested as a potential pathophysiological pathway for RLS, with pharmacological treatments including dopamine agonists or gabapentinoids, em-

phasizing the importance of minimal effective dosages to mitigate symptom exacerbation over time [65] (► **Table 2**).

“Other Sleep Disorders” in ICSD-3 refers to disorders that do not fit neatly into other categories due to overlap or insufficient data for a definitive diagnosis, including those primarily related to environmental disturbances.

Conclusion

Sleep is of vital importance for women as well as for all living species. Sleep periods constitute about one-third of our lives, and thus when disrupted they can have significant negative consequences on quality of life and daytime function. The interaction of physiological and psychological factors appears to contribute to gender differences in the prevalence of sleep disorders in women from puberty to postmenopause. Physiological changes in a woman’s life observed during adolescence, pregnancy, postpartum period and perimenopause may lead to sleep disturbances and the gynecologists might encounter this complain during their daily prac-

tice. Moreover, gynecological entities such as PCOS, PMS are also related with a higher frequency of sleep disorders. Awareness of the higher risk of sleep disturbances in women is important for gynecologists as women will initially share these complaints during their gynecological consultations in most cases. Therefore, the management of sleep disorders in women requires a careful assessment and management by a multidisciplinary team that includes gynecologists in a remarkable number of cases.

Conflict of Interest

The authors declare that they have no conflict of interest.

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