



A Monthly e Magazine
ISSN:2583-2212
Dec 2023 3(12) 4219-4223

Popular Article

The Sleep-Fertility Link: Unravelling the Importance of Quality Rest

Ramya Koneru* and Vinutha U Muktamath¹

*PhD scholar, Department of Human Development and Family Studies,
College of Community Science, University of Agricultural Sciences Dharwad, Karnataka

¹Assistant Professor & Scientist, AICRP-WIA,
University of Agricultural Sciences Dharwad, Karnataka

<https://doi.org/10.5281/zenodo.10431151>

Abstract

Sleep is a physiological process that can restore the depleted physical and mental energy. Irregular sleep-wake syndrome, sleep interruption, overly-long or short sleeping time, hypoxia or circadian disorder were the sleeping problems. Variation in hormonal levels in women, especially during menstrual cycle or pregnancy may have typical effect on sleep cycle. Nevertheless, the studies report that sleep plays a significant role in women undergoing IVF treatment, as insufficient sleep or disturbed sleep may be detrimental during IVF treatment. As infertility is globally recognized psychological distress, it deteriorates the mental wellbeing of intended parents. The infertility treatments are emotionally debilitating, and requires multiple attempts to achieve a pregnancy. Thus, based on research evidence health professionals suggest healthy sleeping pattern for successful IVF attempts.

Introduction

Infertility refers to a medical condition which is alarmingly rising in the present generation often causing severe psychological, physical, mental, spiritual, and medical problems affecting both the individual as well as their partner. “Infertility is defined as not being able to get pregnant (conceive) after one year (or longer) of unprotected sex. Because fertility in women is known to decline steadily with age, some providers evaluate and treat women aged 35 years or older after 6 months of unprotected sex” (Kloss *et al*, 2015). Worldwide the infertility prevalence is 15 per cent (WHO) due to likely causes such life stresses and advancing childbearing age, the frequency of infertility has grown recently (Shahraki, 2017).

Growing research evidence indicates that the sleep is not only essential for vital



functions but also for reproductive health. Sleep quality, sleep quantity and chronotypes were the characteristics of sleep which might affect fertility and associations that are likely bidirectional. Although 7 to 9 hours of sleep during a 24-hour period is considered the recommended amount of time to sleep, one-third of premenopausal women actually sleep less than the recommended time. In addition to sleeping for shorter periods of time than males, women experience more sleep disturbances, which may be brought on by variations in reproductive hormone levels (Özçelik *et al*, 2023).

Significance of sleep on reproductive wellbeing

A natural molecular clock found in the suprachiasmatic nucleus (SCN) which is primary control site in the brain, that regulates physiological and behavioral processes in a rhythmic manner. The suprachiasmatic nucleus (SCN) also synchronizes the circadian rhythmic activity of reproductive hormones. Pituitary luteinizing hormone (LH) release and gonadotropin-releasing hormone (GnRH) pulsatility are stimulated by proper SCN rhythmicity, which is mediated by clock genes. This is carried out through two distinct neural networks: those that contain neurons that contain vasoactive intestinal peptide (VIP) and those that contain neurons that contain arginine vasopressin (AVP).

Maintaining the intricate and time-sensitive pathways of reproductive hormone synthesis and release, as well as the reproductive processes of folliculogenesis, ovulation, fertilization, and implantation, depends on fine circadian rhythm regulation. Infertility is significantly impacted by sleep deprivation due to changes in the expression of clock and clock-related genes.

Nevertheless, sleep is essential for physical health, cognitive function and mental wellbeing of individuals. Inadequate sleep is related to many chronic diseases and conditions like asthma, stroke, arthritis, diabetes, coronary artery disease, obesity, myocardial infarction, chronic kidney disease, chronic obstructive pulmonary disease (COPD) and depression.

Impact of sleep quality on hormones and reproductive health

Hormones	
Folic stimulating hormone (FSH)	FSH promotes the development of ovarian follicles and the granulosa cells' synthesis of estrogen. During the luteal and follicular phases of the menstrual cycle, FSH displays significant 24-hour patterns. The FSH levels are found to be 20 per cent higher among long-time sleepers when compared to short-time sleepers (Touzet <i>et al</i> , 2002).
Luteinizing hormone (LH)	Regulates ovulation, the release of progesterone by the corpus luteum following ovulation, synthesis of androgens from theca cells and estradiol from granulosa cells. Similar to FSH, LH displays significant



	24-hour rhythm when the menstrual cycle is in its follicular phase.
Progesterone	Progesterone is necessary for the implantation and maintenance of pregnancy and regulates the uterine lining. In women who were consistently in menstruation, the mean luteal phase progesterone levels are observed to increase by 9.4 per cent for every hourly increase in daily sleep time Michels <i>et al</i> (2020).
Thyroid stimulating hormone	TSH shows a rhythmic pattern it rises before sleep and peaks during the sleep period/night; it then falls during the wake period/day. Hypothyroidism can affect fertility due to anovulatory cycles, luteal phase defects, hyperprolactinemia, and sex hormone imbalance. (Kim <i>et al</i> , 2019)
Prolactin (PRL)	PRL has pleotropic effects and increases lactation in females. No matter the time of day, prolactin levels rise as soon as sleep sets in. PRL secretion is inhibited during transient awakening, and it rapidly increases after final awakening.
Glucocorticoids	Glucose corticoids effectively regulate sleep through corticosteroid receptors in the brain. Stressful events cause the hypothalamic-pituitary axis to become more active, raising cortisol levels inducing sleep-related problems such as reduced sleep duration and poor-quality sleep.
Melatonin	Melatonin plays crucial role in synchronizing the circadian sleep pattern and acts as modulator of uterine and ovarian function. Sleep deprivation lowers the secretion of endogenous melatonin affecting the quality and quantity of oocytes in women who are infertile (Tamura <i>et al</i> , 2008).

Beroukhim *et al*, 2022. Reproductive Biology and Endocrinology

A meta-analysis reports that disturbed sleep is correlated with a 46 per cent increased risk of menstrual irregularity and alteration in circadian rhythmicity may result in the pathophysiology of Premature ovarian insufficiency (POI) (Auger *et al*, 2021).

Sleep disruptions in women undergoing IVF treatment

Women undergoing invitro fertilization are believed to experience sleep disruptions frequently. Higher psychological stress has been related with failure to achieve clinical pregnancy via invitro fertilization. Sleep difficulties and psychological stress are deeply associated. There may be a bidirectional relationship between stressors and sleep quality since both might exacerbate psychological distress. Moreover, chronic sleep deprivation, which is common in modern society, is a biological stressor that can increase sympathetic nervous system and hypothalamic-pituitary axis activity as well as lead to excessive oxidative stress. Similar physiological characteristics could have a detrimental effect on the results of IVF.



Some studies report the linkage between altered sleep measures and higher risk of miscarriage. In a study by Stocker *et al* (2008), findings revealed that women with recurrent miscarriage slept 36 minutes less per night than women in control group while measured with actigraphy. In a case control study (Samaraweera *et al*, 2010) sleeping less than 8 hours per day was associated with a 3.8-fold increase in risk of miscarriage after controlling for period of gestation.

Suggestions to improve healthy sleep quality for women undergoing IVF

- Maintain a calm, cool and dark bedroom. Research has indicated that the probability of a sleep disorder increases with bedroom temperature (and consequently, with body temperature) during night.
- Avoid taking naps in the afternoon and never in the evening. Naps in the afternoon and evening disrupt the body's natural sleep cycles, which makes it more difficult for the sleep center to transition the central nervous system to a sleep state.
- Work out every day. Try to finish your workout regimen more than four hours before going to bed, and do so for at least twenty minutes.
- Maintain a consistent sleep and wake timetable. After 7-8 hours of sleep each night, get out of bed.
- One stimulant that may lessen the sleep center's efficiency is caffeine, hence better to refrain from caffeine after lunch.
- Avoid alcohol and give up smoking. Don't use nicotine replacements either.
- Limit fluids right before bed. Urging to urinate at night is a typical cause of nocturnal awakenings.

Conclusion

Sleep is an essential biological process for human health, while altering results in impaired reproductive function and poor reproductive outcomes. Disruption in circadian rhythm, may leads to altered sleep, while coincides with suprachiasmatic nucleus of brain further impacts on reproductive processes. The sleep characteristics had a significant bidirectional effect with one's fertility related issues. However, health professionals should compulsorily adopt psychological intervention on healthy sleep patterns, for successful IVF treatment outcomes.

Reference

- Auger N, Healy-Proftos J, Wei SQ. In the arms of Morpheus: meta-analysis of sleep and fertility. *Fertil Steril*. 2021; 115: 596–8.
- Beroukhim, G., Esencan, E., & Seifer, D. B. (2022). Impact of sleep patterns upon female



- neuroendocrinology and reproductive outcomes: a comprehensive review. *Reproductive Biology and Endocrinology*, 20(1), 1-17.
- Kim W, Lee J, Ha J, Jo K, Lim DJ, Lee JM, Chang SA, Kang MI, Kim MH. Association between Sleep Duration and Subclinical Thyroid Dysfunction Based on Nationally Representative Data. *J Clin Med*. 2019; 8: 2010.
- Kloss, J. D., Perlis, M. L., Zamzow, J. A., Culnan, E. J., & Gracia, C. R. (2015). Sleep, sleep disturbance, and fertility in women. *Sleep medicine reviews*, 22, 78-87.
- Michels KA, Mendola P, Schliep KC, Yeung EH, Ye A, Dunietz GL, Wactawski-Wende J, Kim K, Freeman JR, Schisterman EF, Mumford SL. The influences of sleep duration, chronotype, and nightwork on the ovarian cycle. *Chronobiol Int*. 2020; 37: 260–71
- Özçelik, C., Varlı, B., Gökçe, A., Takmaz, T., Çetin, Ç., & Özcan, P. (2023). Evaluation of chronotype and sleep quality in infertile population and comparison with fertile population: a cross-sectional study. *Journal of Psychosomatic Obstetrics & Gynecology*, 44(1), 2148523.
- Practice Committee of the American Society for Reproductive Medicine: Definitions of infertility and recurrent pregnancy loss. *Fertil Steril*. 2008; 90:1–1. [PubMed: 18440533]
- Samaraweera Y, Abeysena C. Maternal sleep deprivation, sedentary lifestyle and cooking smoke: Risk factors for miscarriage: A case control study. *Aust N Z J Obstet Gynaecol*. 2010; 50:352–7.
- Shahraki, Z. (2017). Investigation of effects of sleep disorder in infertile couples. *Int. J. Adv. Res. Biol. Sci*, 4(12), 107-111.
- Stocker LJ, Cagampang FR, Lu S, Ladyman T, Cheong YC. Is sleep deficit associated with infertility and recurrent pregnancy losses? Results from a prospective cohort study. *Acta Obstet Gynecol Scand*. 2021; 100:302–13. Damage and improves fertilization rate. *J Pineal Res*. 2008; 44:280–7.
- Touzet S, Rabilloud M, Boehringer H, Barranco E, Ecochard R. Relationship between sleep and secretion of gonadotropin and ovarian hormones in women with normal cycles. *Fertil Steril*. 2002; 77:738–44.
- Tamura H, Takasaki A, Miwa I, Taniguchi K, Maekawa R, Asada H, Taketani T, Matsuoka A, Yamagata Y, Shimamura K, et al. Oxidative stress impairs oocyte quality and melatonin protects oocytes from free radical.
- [https://www.inviafertility.com/blog/blog/articles/handling-stress/drakarande/difficulty-with-sleep-
insomnia-heres-what-helps/](https://www.inviafertility.com/blog/blog/articles/handling-stress/drakarande/difficulty-with-sleep-
insomnia-heres-what-helps/)

