



# SLEEP HYGIENE AND ITS RELATIONSHIP WITH MALE INFERTILITY FROM THE PERSPECTIVE OF THE PERSIAN MEDICINE: A SYSTEMATIC REVIEW OF THE LITERATURE

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## Abstract

**Aim and Objectives:** Male infertility comprises more than one third infertility problems globally. It has been postulated that sleep hygiene can affect semen parameters such as total count, concentration, and motility. Also, Persian traditional medicine has long advocated the importance of sleep hygiene on general health and reproductive system, hence, this systematic review aimed at evaluating the relationship between sleep hygiene and male infertility from the perspective of Persian traditional medicine.

**Material and Methods:** A systematic search of literature was performed in PubMed, Scopus, Web of Science, IranMedex, and SID from inception to April, 2023 with relevant keywords. Those studies that investigated the role of sleep hygiene on semen parameters and male reproduction have been included. Textbooks of Persian medicine has been used accordingly.

**Results:** After screening, 15 studies have been added in our systematic review. According to the results of the included studies, poor quality of sleep is significantly associated with diminished total sperm count, sperm concentration, sperm motility, and sperm morphology. Five studies reported no significant association between sleep hygiene and semen parameters. The most used sleep questionnaires among the included studies were Karolinska sleep questionnaire and Pittsburgh Sleep Quality Index. Due to high heterogeneity of the included studies and heterogenous comparison of the results, meta-analysis could not be performed.

**Conclusion:** Several studies have indicated the significant association between sleep hygiene and sperm count, concentration, motility, and morphology. The Persian traditional medicine has constantly emphasized on good nutrition and sleep, based on the necessary sixes (the common method for prevention of diseases in Persian medicine) and this method for lowering infertility among males have been disregarded in the literature. This accurately highlights the potential of Persian traditional medicine in prevention and treatment of male infertility. Further studies are needed to elucidate the precise relationship and underlying mechanism.

**Keywords:** Male Infertility, Persian Medicine, Sleep Hygiene, Sleep Disturbance, Traditional Medicine.

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## 1. Introduction

The importance of fertility for the survival of the generation in the health of the family and then the health of the society is very significant, as it is one of the indicators of the health of the society. The prevalence of infertility in different countries has been reported between 10 and 12 percent (1, 2). In Iran, the prevalence of infertility among couples aged 22 to 42 is reported to be about 11%. In another report, a quarter of couples faced primary infertility (3, 4).

The causes of infertility are divided into two categories: female causes and male causes. Male causes account for 30% and female causes account for 42% of cases, and the remaining 28% are without a specific cause. The female factor, which is the most common cause of couples with infertility complaints, is divided into ovarian disorders, tubal and pelvic disorders, uterine and cervical disorders. Persian medicine (Iranian traditional medicine) has defined and investigated the topic of infertility in detail (5-8).

In Persian medicine, disease prevention through hygiene or hygiene measures is related to the observance of the six principles of health maintenance, which is one of its basic rules. These principles include weather, nutrition, body movements, sleep and wakefulness, retention and vomiting, and emotional symptoms. Hygiene was a well-known topic that included similar topics both in civilizations that influenced Islamic civilization, such as Greek and Indian, and from the east to the west of the Islamic realm, including when, what and how to eat and drink; time to sleep and wake up and how to sleep; how to discharge or retain waste materials in the body; take a bath; exercising, how much and when to do it; human nature; properties of perfumes and oils; emotional symptoms; quality of permanent or temporary settlement places; raising and maintaining children and the elderly; pregnant woman care; planning for the seasons; basic information about diseases and their symptoms; and the subject of one of the greatest textbooks of Persian medicine, including instructions for preventing diseases while traveling, protection from cold and heat, what water to drink and what to do on land and sea (9-14). Hence, based on the concept of necessary

sixes and ground literature of traditional Iranian medicine, this systematic review has been designed to evaluate the relationship between the sleep quality and male infertility and analyze it in view of the Persian traditional medicine.

## 2. Methods and Materials

This systematic review and meta-analysis study was conducted based on the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) guideline 2020 (15).

### Search Strategy

Two authors performed a systematic search of literature in the following electronic databases: Web of Science, Scopus, PubMed, IranMedex, and SID. No time limitation was defined and all English and Persian studies from the beginning until April, 2023 were included. The relevant medical subject heading (MeSH) terms and related keywords were used in combination to build the search strategy; ("Sleep hygiene" OR "Sleep disturbance" OR "sleep disorder" OR "Sleep duration") AND ("Male fertility" OR "Male reproduction" OR "Male infertility"). More information regarding the search strategy is presented at Figure 1.

### Eligibility Criteria, Study Selection, and Data Extraction

Our eligibility criteria were defined based on the PICO framework: (P) Population: Infertile males (I) Intervention: sleep quality, (C) Comparison: sleep hygiene among high quality and low-quality sleep among men, (O) Outcome: fertility indices such as sperm volume, count, concentration, and motility. After removing the duplicates, two authors initially screened the included studies based on the title and abstract, independently. Afterwards, the full texts of the articles were obtained for a more in-depth analysis. Any disagreement between the two authors responsible for screening was resolved by a third author.

Case reports, review articles, animal studies, letters to editors, studies with insufficient data, articles with no comparison, and articles in any language other than English and Persian were excluded from our study. Finally, data was extracted

using a standard extraction sheet that is presented in Table 1.

### 3. Results

#### Study Selection

Our initial systematic search of the literature in the five aforementioned online databases retrieved 1372 studies. After removing the duplicates, 1273 studies were included for screening. After screening the studies based on the title and abstract, 45 full texts were retrieved for more in-depth assessment. After the final screening of the studies, 15 studies were included in our systematic review study (16-30). The design of the included studies comprises of cross-sectional studies, prospective cohort studies, and randomized clinical trials in countries such as Denmark, USA, Austria, China, Israel, and India. Further detail regarding the number of included studies and screening process is available in Figure 1.

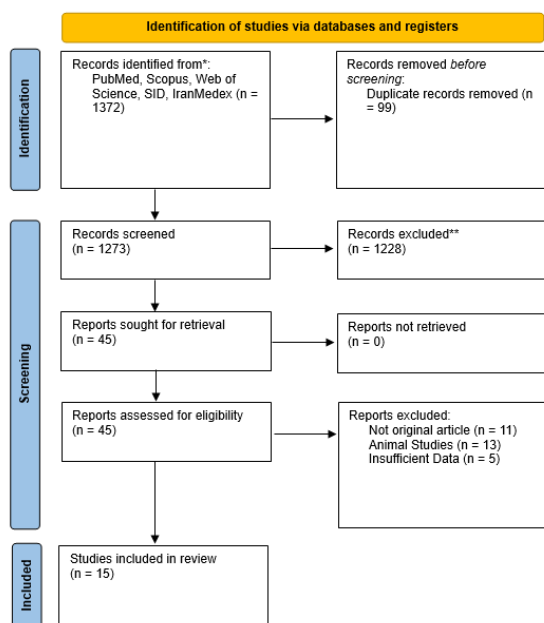


Figure 1: PRISMA Flow Chart of Our Search Strategy

Based on our findings, 12 studies have investigated the association between sleep and male fertility parameters such as sperm count, sperm volume, sperm concentration, sperm morphology, and sperm motility (16-21, 23, 25-28, 30). One study investigated the effect of life style parameters based on a standard questionnaire on semen parameters among male sperm donors (29). The majority of the participants in the included studies were aged between 20 to 45. The most used sleep questionnaires among the included studies were

Karolinska sleep questionnaire and Pittsburgh Sleep Quality Index. Lower sleep quality based on the Karolinska sleep questionnaire was significantly associated with diminished fertility among men. Also, a significant association was found between the self-reported sleep quality and Pittsburgh Sleep Quality Index and sperm concentration and motility. Also, 4 studies did not find any significant association between sleep quality and sperm parameters (16, 18, 19, 25). Due to high heterogeneity of the included studies and heterogenous comparison of the results, meta-analysis could not be performed. further detail is available in Table 1 regarding the included studies.

#### 4. Discussion

According to the findings of the included studies in our systematic review study, sleep quality may be associated with diminished sperm parameters such as total sperm count, sperm concentration, sperm motility, and sperm morphology. Several sleep quality assessment questionnaires such as Karolinska sleep questionnaire, Pittsburgh Sleep Quality Index, and self-reported questionnaires were used in the literature. Also, five of the included studies did not report any significant association between sleep quality and male infertility; hence, further studies are indicated to investigate such association and underlying pathophysiology.

One of the important issues of medical science is infertility. Infertility occurs when a couple under 35 years of age tries to conceive for one year and over 35 years of age for 6 months, despite stopping contraceptive methods, but no pregnancy occurs. At least one out of every six couples are facing the problem of infertility. According to the report of the World Health Organization, pregnancy failure has affected 40 million people in the world. Male infertility is considered in 44% of infertility cases. Therefore, the importance of correcting this disorder is necessary to help couple's fertility. Infertility treatment varies depending on the cause and the age of the couple. Nutrition and lifestyle modification have a very important effect on the health of the body and, accordingly, the reproductive system. A remarkable point in the sources of traditional Iranian medicine is the attention of Iranian physicians to the matter of nutrition in the treatment of diseases. The

study of sources showed that the treatment of infertility has always been of great importance to physicians since ancient times. They divided the cause of infertility into male and female (5, 8, 13, 31-37).

The review of the literature showed that the causes of male infertility in traditional medicine and modern medicine have many similarities with each other, and this shows that Iranian physicians have been familiar with the category of infertility for centuries. In both the views of traditional medicine and modern medicine, the causes of infertility can be related to the structure of the reproductive system (testicles, ducts and penis); Sometimes the cause should be sought before the testicles, such as dysfunction of the brain, liver and kidneys; And in some cases, sexual disorders can play a role in infertility. As mentioned, in traditional medicine, to investigate the causes of sperm disorder, special attention is paid to all stages of sperm production. The health and strength of the heart, brain, liver, and kidneys are necessary in sperm production, but in modern medicine, mainly pre-testicular causes are not given much attention in the initial stages (18, 27, 38). Like fatty liver and indigestion in an infertile couple, the treatment of infertility in these patients is done like other couples, while in the view of traditional medicine, treatment of these disorders is mandatory even in the early stages. Modifying diet and correct lifestyle is the first intervention that should be done for infertile patients. The traditional Iranian medicine have paid a lot of attention to the issue of maintaining hygiene and observing the principles of health and have made health maintenance measures the first step of their treatment. Eating, drinking, and sleep are among the most important reasons. How to eat and drink is very important as a source of semen (6, 32, 34-37, 39-42).

Sleep and wakefulness are very important for maintaining health and relaxation. Regarding sleep and wakefulness, how much sleep and where to sleep should be taken into consideration. Avoiding too much sleep, avoiding waking up too much, and avoiding long sleeps during the day are recommended. Regarding the sleeping place, it is important to pay attention to the temperature and

sleeping place, and it is recommended to avoid sleeping in cold and damp places (34-38, 43, 44).

Since the cause of 34% of infertility cases is unknown, it seems that the most use of traditional medicine can be in the treatment of idiopathic infertility; Although the treatment of this disorder in modern medicine is mainly the use of vitamins and antioxidants, which is actually a nutritional approach, these treatments have brought different results. In these cases, you can benefit from traditional medicine. In cases where a specific pathology such as disorders caused by pituitary function is diagnosed for the patient after detailed history taking and paraclinical investigations, brain strengthening foods can be included in the diet in addition to the necessary drug treatment. Another use of traditional medicine in the treatment of infertility is to improve the conditions of patients who volunteer to use assisted reproductive methods. Today, with scientific advances, the probability of pregnancy with assisted reproductive methods has increased. On the other hand, studies show that the results of treating couples, who in addition to these methods, if they had proper nutrition, is more successful. Using traditional medicine measures before assisted reproductive methods can be useful. Based on these findings, using the therapeutic experiences of traditional medicine along with modern treatments can open the way for future research and provide research projects in this field and help the progress of treatment (7, 34-37, 45-48).

## 5. Conclusion

This systematic review study has been conducted to thoroughly review the current literature regarding the relationship of sleep hygiene with male infertility parameters and analyze and discuss the results in view of the Persian traditional medicine. According to the included studies, several studies have indicated the significant association between sleep hygiene and sperm count, concentration, motility, and morphology. As it has been mentioned in the manuscript, the Persian traditional medicine has long advocated in good nutrition and sleep according to the necessary sixes concept. Such methods for lowering infertility among males have been disregarded in the literature. This highlights the



potential of Persian traditional medicine in prevention and treatment of male infertility.

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Table 1: Summarized Characteristics of the Included Studies

Author, Year	Design of the Study	Country	N	Age	Type of Evaluation	Outcome
Wogatzky et al., 2012 (16)	Cross-sectional Study	Austria	1,683	40.4 ± 5.9	Self-reported questionnaire	No significant association was found.

Jensen et al., 2013 (17)	Cross-sectional Study	Denmark	953	-	Sleep Questionnaire	Inverse U-shaped association between sleep disorders and sperm concentration and morphology
Eisenberg et al., 2015 (18)	Prospective cohort study	USA	456	31.8 ± 4.9	Interview	No significant association was found.
Chen et al., 2016 (19)	Prospective cohort study	China	796	20 – 21	Questionnaire	Inverse U-shaped association between sleep duration and semen volume and total sperm count. No significant association between sleep quality and semen parameters after adjustment on sleep duration
Liu et al., 2017 (20)	Randomized interventional study	China	981	20 – 40	Questionnaire	Lower total sperm count and motility in short sleepers. Association between late bedtime and low total sperm count. No significant differences in sperm morphology
Vigano et al., 2017 (21)	Cross-sectional Study	Italy	382	-	Self-report questionnaire	Negative association between sleep quality (difficulty in initiating sleep or lying awake most of the night) and sperm parameters
Mishra et al., 2018 (22)	Cross-sectional Study	India	7020	20.9	Semen volume, concentration, motility, morphology, viability	Semen parameters in Indian men have declined with time and the deterioration is quantitatively higher in the infertile group.
Shi et al., 2018 (23)	Cross-sectional Study	China	328	38.2 ± 5.6	Semen volume, concentration, motility, morphology, viability	DFI and TSC were the most sensitive semen parameters for demographic and lifestyle features
Huang et al., 2019 (24)	Cross-sectional Study	USA	96	31.63 ± 5.87	Semen volume, concentration, motility, morphology, viability	This study could shed new light on the potential mechanisms linking environmental pollutant exposure to health outcomes based on the general framework of molecular epidemiology
Pokhrel et al., 2019 (25)	Cross-sectional Study	China	1,101	26 – 35	Semen volume, concentration, motility, morphology, viability, count	No association between sleep duration and sperm parameters
Du et al., 2020 (26)	Prospective cohort study	China	111	30.25 ± 5.18	Semen volume, concentration, motility, morphology, viability	Negative association between sleep quality and sperm concentration, motility and morphology.
Green et al., 2020 (27)	Cross-sectional Study	Israel	116	-	Questionnaire, Semen volume, concentration, motility, morphology, viability	Positive association between sleep duration and sperm motility Negative association between subjective sleepiness and sperm motility
Hvidt et al., 2020 (28)	Randomized controlled trial	Denmark	104	34	Semen quality, questionnaire	No association between sleep quality and semen quality (self-reported) Lower semen quality in short (7.0–7.49 h) and very short (< 7.0 h) sleepers. Association between late bedtime and reduced semen quality.
Huang et al., 2021 (29)	Cross-sectional Study	USA	592	30.9 ± 5.2	Semen volume, concentration, motility, morphology, viability	Abstinence time was highly associated with semen parameters and donor qualification.
Alvarenga et al., 2023 (30)	Randomized controlled trial	Brazil	90	20 – 40	Hormonal balance, Semen volume, concentration, motility, morphology, viability, questionnaire	observed a reduction in total testosterone following total sleep deprivation, but no effect after REM sleep deprivation.