Int J Ayu Pharm Chem

www.ijapc.com
e ISSN - 2350-0204
Volume 8 Issue 3
5/10/2018

Greentree Group Publishers

Int J Ayu Pharm Chem

REVIEW ARTICLE

www.ijapc.com

e-ISSN 2350-0204

Evidence Based Management of Insomnia through Ayurveda

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ABSTRACT

Aim: To briefly review the existing knowledge about concept and treatment modalities of *Anidra* (Insomnia) in Ayurveda, explore their scientific evidences and look for scope of future research.

Background: Ayurveda includes sleep or *Nidra* amongst the three pillars of life. Ayurvedic texts describe causes, symptoms and management of *Anidra* or *Nidranasha* which can be utilized for better management of insomnia bypassing the side effects of allopathic sedatives and tranquilizers.

Review results: Ayurveda offers an effective management for *Nidranasha*, including drugs, *Panchkarma* therapies, lifestyle and dietary modifications. These regimens have a benefit of holistic approach and are devoid of side effects and addiction of allopathic drugs. Sedative action of drugs like *Centella asiatica, Bacopa monnieri, Celastrus panniculatus, Acorus calamus* etc have been proved by *in vitro* and *in vivo* studies. Clinical trials on *yoga*, lifestyle interventions, *shirodhara* also prove their efficacy in Insomnia.

Conclusion: Ayurveda is effective in managing insomnia.There is further scope of conducting clinical studies on effect of drugs and *Panchkarma* procedures in insomnia with a larger sample size.

Clinical significance: Insomnia or *Nidranasha* is a commonly encountered problem in nearly 25-30 percent of general population. It results in fatigue, lowered immunity, depression, hypertension, obesity, diabetes mellitus, cardiac disorders and shortened lifespan. Effective management of insomnia through Ayurveda would prevent the complications of insomnia, treating the condition per se.

KEYWORDS

Insomnia, Management, Ayurveda, Nidranasha, Stress, Anxiety, Sleep Management

Greentree Group

Received 20/04/18 Accepted 04/05/18 Published 10/05/18

INTRODUCTION

Sleep is an essential physiological function in human beings which is vital for adequate daytime activity. It is not a mere passive state but requires an intricate network of neurotransmitters and neurons of central nervous system. Insomnia literally means "lack of sleep" (latin: insomnium). Problems in initiation of sleep and its maintenance is a general complaint in Indian population accounting to an incidence of 25-30%. Age wise incidence is 28.1 %, 59 % and 17.3 % cases in adult subjects of 30-60 years, elderly subjects and school children respectively. Incidence of insomnia is affected by age, gender, urban lifestyle and presence of co-existing complaints like severe pain, heart diseases, muscular disorders, joint diseases and gastrointestinal disorders[1].

The magnitude of problem can be understood by the fact that one in three people suffer from some form of insomnia during their lifetime.Women are twice more likely to suffer from insomnia than men. A family history is positive in 35% of insomniacs. People with sleep deprivation are 27% more likely to become overweight. Apart from medical consequences of insomnia, it also has serious financial implications. Huge amount of money is spent annually on medical costs that are directly related to sleep disorders. Drowsy driving costs a large number of lives annually. Employers spend much greater amounts as health care costs on employees with sleep problems than for those who sleep well. In United States industry loses about $ 150 billion each year because of workers with sleep issues[2]. A two-phase cross-sectional prevalence study found that the prevalence of SDB (Sleep disordered breathing) was 19.5%, and that of OSAHS (Obstructive sleep apnea/ hypopnea syndrome) was 7.5% in healthy urban Indian males between 35-65 years of age. The high prevalence rates in middle-aged urban men might have important public health implications in our country with limited health resources[3]. A cross-sectional observational study to determine the prevalence of Insomnia amongst Indian corporate employees revealed that 13.8% workers were suffering from insomnia which is adversely affecting their health, performance at work, household duties, and relationship with family[4].

NEED FOR REVIEW

Medications for insomnia like benzodiazepines show several side effects, heavy sedation and drug dependency. Though Ayurveda is used frequently for

treatment of insomnia in India, scientific evidence regarding its efficacy needs to be studied and presented to public for its wider publicity and acceptability in our country and abroad. This article presents a bird's eye view of concept of sleep and insomnia in Ayurveda, its management options and scientific relevance of the same.

RESEARCH METHODOLOGY

Classical text books such as *Charak Samhita*, *Sushruta Samhita*, *Astanga Hridaya*, *Astanga Sangraha*, *Madhav Nidan* etc. were taken into consideration. Online database like AYUSH Research Portal, Researchgate, Pubmed, Google scholar, Scopus and DHARA (Digital Helpline for Ayurveda Research Articles) were searched. Keywords searched were insomnia, sleep, management of insomnia by Ayurveda, *Shirodhara* in *Anidra*, medicinal plants for insomnia, pharmacology of medicinal plants, *in vivo* and *in vitro* study of medicinal plants etc. Articles published in peer reviewed indexed online open access journals in last 15 years were included in study.

Concept of sleep and insomnia:

a) Sleep and its physiology:

The timing, depth, and duration of sleep are controlled by the interaction of time in a day (circadian control, process C) and by the duration of prior wakefulness (homeostatic control, process S). According to the reciprocal interaction model, a brainstem circuitry of mutually inhibiting cholinergic and monoaminergic nuclei can account for the NREM-REM cycle. Role for mutually inhibiting GABAergic neurons contained within REM-on and REM-off brainstem regions has been postulated. Onset of REM sleep may be regulated by hypothalamic GABA neurons through the recruitment of the extended ventrolateral preoptic area (eVLPO). In addition, a subset of melanin-concentrating hormone (MCH) neurons in the lateral hypothalamus were found to be active at REM onset and fire exclusively during REM sleep. On the other hand, MCH-negative GABA neurons of hypothalamus are active when sleep is of REM type. Exit from REM sleep seems to be regulated by waking-promoting systems such as the pontine and medullary monoaminergic neurons, tuberomammilary histaminergic neurons, and the hypothalamic orexin/ hypocretin neurons[5,6].

When a person is awake, he/she exhibits β waves and α waves. While β waves are of highest frequency and lowest amplitude, α waves are of slower frequency and increased amplitude. During awakening alpha and beta waves are predominant. β

waves are associated with cognitive, sensory and motor activities, while α waves are associated with relaxation states like meditation. A normal night sleep comprises of four stages, exhibiting θ waves (stage 1 and 2) and δ waves (stage 3 and 4). θ waves have lower frequency and greater amplitude than alpha waves and δ waves are the slowest and highest amplitude brain waves. Delta sleep is the deepest sleep. Another stage of sleep namely REM is associated with dreaming. Thus a sleeping person undergoes stage 1 to 4 and back, except that stage 1 is replaced by REM sleep. This cycle is repeated throughout night[7].

Sleep has important physiological functions such as regulating metabolism, catabolism, temperature, learning and memory consolidation.

b) Sleep (*Nidra*) in Ayurveda:

Ayurveda holds that when the mind and *indriyas* get exhausted, they withdraw themselves from their objects, thus the individual sleeps down[8]. *Acharya Chakrapani* opines that sleep is nothing but location of mind in a place unconnected with sensory and motor organs[9]. The sleep caused by nature during night is considered to be the excellent sleep. It keeps a person lively, nourishes him like a mother, so it is called '*Bhutadhatri'*. *Sushruta* is of the view that *Nidra* is like *maya* of *Vishnu*, it naturally comes to all human beings, emphasizing its physiological importance[10].

Acharya Carak and *Vagbhatta* have classified *nidra* (sleep) into six and seven types respectively[11]:

- ***Tamobhava nidra*:** It is produced due to *tamas* and is the root cause for diseases.
- ***Sleshmasamudbhava nidra*:** This type of sleep is produced due to aggravation of *kapha*.
- ***Manahshramsambhava nidra*:** This type of sleep is produced due to mental exhaustion.
- ***Shareershramsambhava nidra*:** This type of sleep is produced due to physical exhaustion.
- ***Agantuki nidra*:** It occurs due to *tamas* and is signal of any forthcoming disease.
- ***Vyadhyanuvartini nidra*:** It is produced due to *Kaphaja* disorders.
- ***Ratriswabhavprabhava nidra*:** It is natural sleep which occurs during night due to circadian rhythm.

Nidra is crucial for health as happiness or misery, well built or emaciation, strength or weakness, sexual strength, knowledge or ignorance, life or death, are all dependent on proper or improper sleep[12]. *Nidra* is second amongst the *Traya Upastambha* i.e., one of the three important pillars to sustain life; the other

two being Ahara and Brahmacharya[13]. Nidra is also described as one of the non-suppressible urges[14].

c) Insomnia and its causes:

According to National Centre for Sleep Disorders Research Classification, Insomnia comprises of subjective complaints of difficulty in falling asleep, difficulty in maintaining sleep, early awakening and non-refreshing sleep. Etiology of insomnia can be primary and secondary. Primary insomnia can occur due to adjustment disorder, psychophysiological insomnia, sleep state misperception and idiopathic insomnia. Secondary insomnia may be due to environmental sleep disorder, inadequate sleep hygiene, psychiatric disorders like anxiety, depression, mania, schizophrenia, addiction like alcohol, medical illness like chronic obstructive airway disease, asthma, rheumatological disease, neurological disorders such as parkinsonism, dementia, medications such as nicotine, bronchodilators, steroids, beta blockers, sleep wake cycle disorder such as jet-lag, shift work, sleep related breathing disorder such as sleep apnea[15].

d) Concept of Insomnia (*Nidranasha / Anidra*) in Ayurveda:

Nidranasha is considered as an independent disease in the context of *Vata nanatmaja vyadhi* and also as a symptom in various physical and psychological disorders[16]. Loss of sleep or *Vaikariki nidra* occurs in patients whose *kapha* is decreased, *vata* is increased or who suffer from physical or mental ailments[17]. *Acharya Sushruta* says that Nidranasha occurs due to aggravation of *vata* and *pitta*, psychological disorders, extreme weakness or ill health and physical trauma[18].

Acharya *Charak* discusses that insomnia may be caused due to excess purgation, emesis or blood letting, increased physical exertion, overworking, debility due to old age or diseases, excess fasting and uncomfortable bed. He also opined that psychological factors like fear, anger or anxiety and predominance of *satva guna* along with vata *prakriti* causes insomnia[19]. *Acharya Vridhha Vagbhatta* has described clinical features of *Nidranasha*. It leads to yawning, bodyache, lethargy, headache, giddiness, pain in eyes, apathy, fatigue, indigestion and *vata* diseases[20].

Management of *Nidranasha/ Anidra* (Insomnia):

Management of *Nidranasha* can be done according to Ayurveda as follows[21]:

a) ***Ahara* (Diet management):** Patients of *Anidra* should intake heavy diet comprising mainly of carbohydrates and fats. *Shali* rice, curd, milk, wheat, *pishtanna* (recipe made of pulses floor),

sugarcane products, cow ghee, sweet dishes, food preparations with plenty of oil/ghee, meat soup etc. should be used. In fruit category, insomniacs should prefer grapes, mango, banana, litchi, *chikoo* (Sapodilla), etc which have a high glycemic index. Amongst milk of various animals, *Mahishi ksheer* (buffalo's milk) is best for enhancing sleep[22, 23]. Use of alcohol has also been advocated in classical texts of Ayurveda, which might be due to its short term effect of decreasing anxiety. Ayurveda also guides about good practices for alcohol consumption and warns against alcohol abuse.

b) *Vihara* (Lifestyle modification): Patients suffering from lack of sleep should include *Yoga* in their daily routine. *Yogic* practices like *Anuloma vilom pranayama, Asanas* like *Suryanamaskara, Padmasana, Pascimottanasana, Shavasana* etc. and *Yoga Nidra* reduce stress, thus improving sleep. Bathing at bedtime, psychic pleasure, smell of scents, soothing music, application of soothing ointment to eyes, head and face, comfortable bed and going to bed at same time everyday helps fight *Anidra*[24].

c) *Achara* (Conduct and behavioral modification): As stress and anxiety remains the mainstay of etiology of insomnia, efforts need to be directed to reduce the same. *Yama* and *Niyama* are the first two steps of *Ashtanga Yoga*. They form a code of conduct for common man and give moral, ethical and societal guidelines. *Yama* includes *Satya* (truthfulness), *Ahimsa* (non-violence), *Brahmacharya* (continence), *Astyeya* (non-stealing) and *Aparigraha* (non-coveting). *Niyam* includes *Shaucha* (physical and mental purity), *Santosh* (contentment), *Tapas* (asceticism), *Svadhyaya* (self study) and *Ishvara pranidhana* (devotion). These principles when followed give mental stamina, minimize stress and combat anxiety[25].

d) Ayurveda therapies: *Abhyanga* (whole body massage) with medicated oil, *samvahana* (rubbing the body by hand), *moordhnitaila* (oil massage on head), *gatra udwartana* (rubbing the body with medicated powder), *shirodhara*(dropping of linear flow of medicated oil on head) should be given to patients of sleep loss[26].

e) ***Aushadh* (Medications):** Drugs which alleviate sleep problems are *medhya*/brain tonics like *Ashwagandha, Jatamansi, Brahmi, Mandukparni, Tagara, Parsika yavani, Yashtimadhu, Ajvayan, Jatiphala* and *Shankhpushpi*[27, 28].

Pharmacological properties of drugs acting on insomnia:

The pharmacological properties and chemical constituents of drugs acting on insomnia are enumerated in Table 1.

Table 1 Pharmacological properties of drugs acting in Insomnia

S. No.	Drug	Pharmacological properties	Chemical constituents
1.	Brahmi[42] (*Bacopa monnieri*) Family: S*crophulariaceae*	Memory booster, Sedative, Tranquilizer, Enhances nerve impulse transmission, Antidepressant, Anti-anxiety, Membrane dephosphorylation, Increases protein and RNA turnover in brain, Restoration of synaptic activity.	Alkaloid 'brahmine', D-mannitol, saponin, hersaponin, Bacoside A & B
2.	Mandokparni[43, 44] (*Centella asiatica*) Family: Apiaceae	Tranquilizer, Sedative, Ant anxiety, Intellectual improvement in mentally retarded children, Immunomodulator.	Triterpenoide, saponins, Asiatic acid, brahminoside, centeloside, triterpenoide, brahmic acid, isobrahmic acid, centic acid.
3.	Bhanga[45] (*Cannabis sativa*) Family: Cannabinaceae	Eases depression, decreases pain, helps in sleep disorders	THC, Cannabinol
4.	Vacha[46,47] (*Acorus calamus*) Family: Acoraceae	Sedative, CNS depressant, behavior modifying, anticonvulsant, antioxidant, acetylcholinesterase inhibitory,memory enhancing, cytoprotective, antidiarrheal, antimicrobial, antihelmintic, insecticidal.	Mixed fatty acids, sugars, acorenone, isocalamendiol, Terpineol, Epieudesmin
5.	Aragvadh[48,49] (*Cassia fistula*) Family: Leguminosae	Potentiating sedative actions of sodium pentobarbitone, diazepam, etc. Potentiation of analgesia induced by morphine and pethidine in a dose-dependent manner. Influences behaviour.	Rhein, Fistulic Acid, Catechin, Sennoside, epicatechin, Proanthocyanidin
6.	Jyotishmati[50] (*Celastrus paniculatus*) Family: Celastraceae	Neuromodulating effect, Anti-nociceptive & anti-inflammatory activity, Nootropic activity, Memory enhancing activity, Tranquilizing effect, Cognitive enhancing properties	Saturated fatty acids (butyric acid, caprylic acid), mono saturated fatty acids (palmitoleic acid, oleic acid), poly saturated fatty acids (linoleic acid, eicosadienoic acid) A*lkaloids (*Celastrine) *Terpenoids* (dihydrogarofuran) *Ester* (malkanguniol, malkangunin) *Steroids (*Beta-sitosterol, celastral)
7	Tagara[51] (*Valeriana wallichii*) Family: Valerianeceae	Smooth muscle relaxant, Neuroprotective effect, Sedative, Anxiolytic, Antioxidant, Anti-inflammatory and Hypnotic.	Essential oil, sesquiterpenoids (valerenic acid), amino acids (arginine, GABA, glutamine), Alkaloids, Phenolic acids, flavonoids, β-sitosterol, fatty acids
8	Jatamansi[52] (*Nardostachys jatamansi*) Family: Valerianaceae	Anticonvulsant Activity, Antiparkinson's activity, Tranquillizer, Hepatoprotective, Neuroprotective, Hypotensive, Hypnotic	Nardo-stachysin, sesquiterpene (Jatamansone or valeranone, β-sitosterol, jatamansin), coumarins, lignans, alkaloids (actidine)
9	Sarpagandha[53] (*Rauvolfia serpentina*) Family: Apocynaceae	Treats Cardiovascular Diseases, High Blood Pressure, Hypertension, Arrhythmia, Mental Disorders, Various Psychiatric Diseases, Breast Cancer	Ajmaline, Ajmalimine, Deserpidine, Indobine, Indobinine, Reserpine, Rescinnamine, Rescinnamidine, Serpentine, Serpentinine, Yohimbine
10	Ashwagandha[54] (*Withania somnifera*) Family: Solanaceae	Anticancer activity, Neuroprotective, Anti-epileptic, Spermaogenic, Hepatoprotective, Anti-Inflammatory, Anti-arthritic, Anti-depression, Anti-anxiety	Withanolides, withaferin-A
11	Shankhpushpi[55] (*Convolvulus pluricaulis*) Family: Convulvulaceae	Anti-depression, Anti-diabetic, improves Learning and Memory, Anti-microbial, Insecticidal, Antifungal, Antibacterial, Antihelmintic, Anticonvulsant, Anxiolytic, Neuroprotective.	Carbohydrate-D-Glucose, Maltose, Sucrose, Starch, Amino Acids, Alkaloids-Convolvine, Convolamine, Phyllabine, Convosine, Convolvidine, Fatty Acid, Hydrocarbons, Scopoletin, Glacial Acetic Acid, Coumarins, Tropane Alkaloids, Linoleic Acid, Palmitic Acid

Scientific evidences of Ayurvedic management of *Nidranasha* (Insomnia):

1. In a case study conducted at National Institute of Ayurveda, Jaipur, a female patient of insomnia, aged 42 years was presented with the complaints of loss of sleep, fatigue, numbness and heaviness in head since last 10 years. Treatment given was Shirodhara with *Himasagara Tailam* for 30min for the duration of 21 days and Nasya with *Brahmi Ghrita* for the duration of 21 days along with *Medhya Rasyana* i.e. *Manasmitra Vatkam* (one tablet twice daily), Mentocalm (two tablets twice daily), *Saraswatarishta* (10 ml thrice daily). The treatment had shown positive response by increasing duration of sleep and quality of sleep along with over wellbeing in terms of quality of life[29]. No blinding or control was used.

2. In a randomized open label clinical study conducted on 30 patients of Insomnia, between 18-80 years of age of both sexes, *Bhastrika Yogic Kriya* (for 20 minutes per day) and *Jatamansi ghan vati* (4 gram per day in two divided doses) for thirty days significantly improved symptoms of *Nidranasha* like *Jrimbha* (Yawning), *Tandra* (Drowsiness), *Sirahashoola* (Headache), *Ajirna* (Indigestion), *Agnimandya* (anorexia) and *Malabaddhata* (constipation) [30]. The study was prospective with parallel arm design without a control group.

3. In an open label clinical trial conducted on 30 patients of *Nidranasha* of age group 20-70 years of both sex, *Godugdha shirodhara* (*Shirodhara* by cow milk) was administered for 30 minutes for a period of seven days at temperature of 38-40 degree centigrade. 78% patients reported relief in symptoms, while the mean sleep efficiency index increased from 42.95% to 79.84%[31].

4. In a controlled clinical trial on influence of *Yoga* and Ayurveda on self-rated sleep scale in a geriatric population of 69 patients, stratified based on age (five year intervals) and randomly allocated to three groups i.e., *Yoga* (physical postures, relaxation techniques, voluntarily regulated breathing and lectures on *yoga* philosophy), Ayurveda (a herbal preparation), and Wait-list control (no intervention). The group allocated for *Yoga* resulted in a decrease in time taken to fall asleep (approximately 10 min), increased duration of sleep (approximately 60 min increase) and had an increased sense of being rested after waking up as compared to other groups[32].

5. In a Randomized Controlled Single Blind Clinical Study on *Anidra*, 60 clinically diagnosed patients of insomnia were divided in four groups receiving

management with tab Zolpidem, *Mansyadi kwatha* (*Nordystachys jatamansi*, *Withania somnifera*, *Hyoscymus niger*), *Shirodhara* with lukewarm milk and a combination of *Mansyadi kwatha* and *Shirodhara* respectively. In combined therapy group, *Mansyadi kwatha* (orally) and *Shirodhara* were shown to have synergistic effects in the management of *Anidra* and the results were more encouraging than other three groups[33].

6. In a placebo controlled clinical trial on 111 patients of insomnia, placebo group patients reported results as 5·81% highly improved, 16·28 % improved, 24-42 % moderately improved, 30·23 % slightly improved and 23·26 % not improved at all while the patients on *Sarpagandha Kalpa* treatment, reported 8.1 % highly improved, 60-47 % patients improved, 22·10 % moderate relief. 5·81 % slightly improved and 3-48 % were not having any relief in the symptoms of *anidra*[34].

7. Animal study of methanolic extract of the leaves of *Mentha arvensis* was carried out for its anti-inflammatory and sedative hypnotic activity on albino rats. Anti-inflammatory activity was shown by the extract but was less than that observed by the standard drug Nimesulide. The extract showed potentiation of pentobarbitone induced sleeping time[35].

8. In an open label comparative clinical trial, *Dashmool sadhita Ksheerdhara* (Cow milk processed with drugs of Dashmool group) was observed to have better results in insomnia as compared to plain *Ksheerdhara* (Cow milk)[36]. This may be due to *vatashamak* property of *Dashmool*.

9. In an open label randomized clinical study on 30 patients of insomnia, aged between 18-60 years, patients were divided in two groups, receiving *Til Taila Shirodhara* and *Yoga* therapy for 15 minutes in morning respectively for fifteen days. Both the groups showed significant improvement in quality and duration of sleep[37].

10. In a prospective case series study, 10 patients of insomnia were given *shirodhara* with coconut oil processed with *Brahmi* (*Hydrocotyle asiatica*) for 40 minutes for 5 days. They were assessed by a self report questionnaire which included parameters like waking up early in morning, difficulty in initiation and maintenance of sleep, daytime sleepiness, distress due to decreased sleep and noticeability of sleep problems by others. All the patients reported improvement[38].

11. An open label clinical study on 33 patients of stress induced insomnia showed improvement in sleeplessness, sleep time, freshness after awakening by a polyherbal

formulation *Tagaradi kwath* and buffalo milk *shirodhara*, the latter being more efficacious[39].

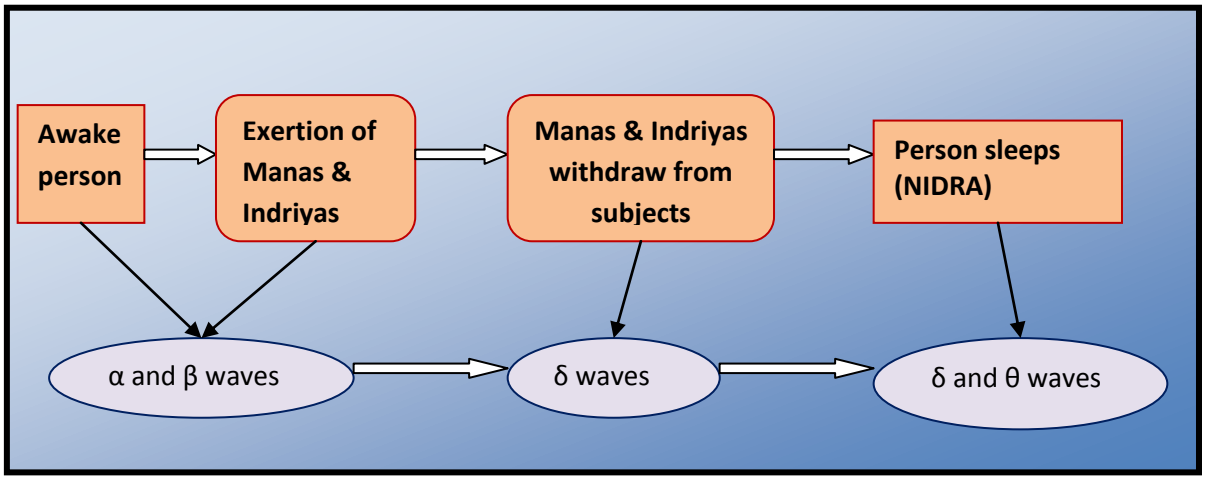

Fig 1 Physiology of *Nidra* and its Correlation with Brain Activity

12. In a randomized single blinded crossover study, conducted on 20 patients, each patient received 30-minutes of *shirodhara* with sesame oil and *shirodhara* with warm water for two weeks with a washout period of 2 months. *Shirodhara* with sesame oil was found to be more efficacious than that with warm water in insomnia assessed by Pittsburgh Sleep Quality Index (PSQI) for sleep quality, Epworth Sleepiness Scale (ESS) for daytime sleepiness, World Health Organization Quality of Life 26 (WHO-QOL26) for QOL, and a sleep monitor instrument for objective sleep measures[40].

Thus the above studies suggested effectiveness of *Yogic* practices, *shirodhara* and Ayurvedic drugs on insomnia of different age groups. Cases with a long standing history of ten years of sleeplessness showed marked improvement after completion of 21 days course of *shirodhara*. This opens a hope for chronic insomniacs as well. *Yoga* is vital for soothing of mind, decreasing anxiety and improving sleep quality which gives a sense of well being on getting up in morning. It also decreases the time patient take to fall asleep and increase hours of sleep. Studies also suggest that a combination of drug and *shirodhara* is more efficacious compared to drug alone. The combination shows more effect than an allopathic drug Zolpidem. Some Ayurvedic drugs don't have a sedative effect per se but potentiate the sedative effect of other Ayurvedic and allopathic drugs, making the latter drug work at a lower dose.

DISCUSSION

The concept of *Nidra* in Ayurveda states that a person traverses from state of wakeful activity to mental and physical

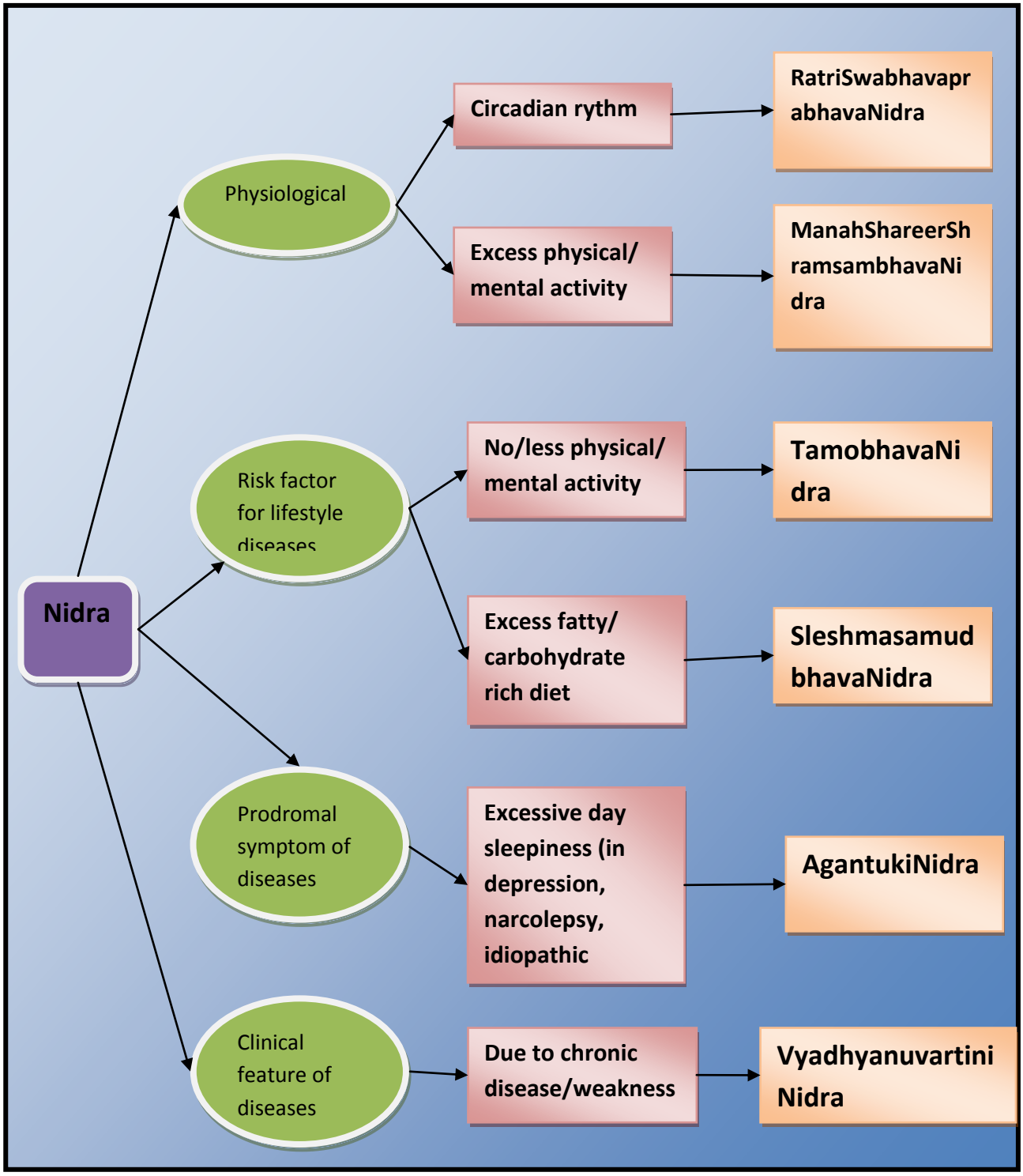

Fig 2 Association of types of *Nidra* to diseases

exertion, and then to drowsiness (when *manas* and *indriyas* withdraw from their subjects), which results in *Nidra* (sleep). The brain activity for these stages shifts from α and β waves to δ waves and finally to theta waves, when a person has deepest sleep (Figure 1). Despite detachment of *Indriyas*, the person remains responsive to stimulus of greater intensity light, loud noise, pain, vigorous tactile stimulation etc. Various

types of *nidra* also have relation to various stages of disease (Figure 2).

Nidranasha is primarily caused due to *Vata dosha* as aggravated *Vata* disturbs sleep physiology by altering level of neurotransmitters like serotonin and melatonin. *Chala* and *Ruksha* properties of *vata* may be attributed for it. Hence management of *Nidranasha* should be aimed at reducing *Vata Dosha* aggravated due to various etiological factors. *Shirodhara* with *taila* pacifies *vata*, thus relieving insomnia. *Shirodhara* with oil medicated with drugs like *Dashmool* which are pacifiers of *vata* also give encouraging results. When oil is poured upon forehead from a certain height, it generates momentum due to change in the form of energy. This momentum may cause change in voltage and stimulate nerve impulse generation or accentuate its conduction. The magnitude of momentum decides the voltage difference for nerve impulse generation and conduction. If its magnitude is small the energy is absorbed by the skull only. This may be the probable reason why drug is given for 45 min- 1 hour in *Shirodhara*. Shirodhara produces a constant pressure and vibration which is amplified by hollow sinus present in frontal bone. The vibration is then transmitted inwards through the fluid medium of cerebrospinal fluid which may activate thalamus along with basal forebrain bringing serotonin and catecholamine to normal levels[41].

Drugs like *Bacopa monnieri, Centella asiatica, Withania somnifera, Convolvulus pluricaulis* etc. have proved memory booster, sedative, tranquilizer, antidepressant and anti-anxiety effects. They also enhance nerve impulse transmission, and help in restoration of synaptic activity. Therefore, these drugs are helpful in relieving symptoms of insomnia. Apart from drugs, Ayurveda emphasises on dietary and lifestyle modifications. The five *Yama* and *Niyam* of *Ashtanga Yoga* help in preventing and curing stress, anxiety and insomnia.

Shirodhara has proved to be a promising therapy for insomnia. Various clinical trials have shown effect of *shirodhara* on insomnia by using several medium viz. *Til taila*, Cow milk, medicated coconut oil, medicated cow milk, medicated oils etc. But there is no clear picture regarding which medium should be used in which type of insomniacs for *shirodhara*. Also duration of *shirodhara*, distance of *shirodhara* pot from patient`s head and number of days *shirodhara* is to be given needs to be standardised. Research should also be done evaluating differences of efficacy of different medium for shirodhara. This would help come out with a cost effective solution for common people.

Various epidemiological studies have been published on insomnia taking into account

age, sex, co- morbidities, geographical location/ country of patients but epidemiological genetic links of insomnia are yet to be explored. Also association of insomnia with *prakriti* (physical and mental constitution) of patient needs to be epidemiologically analyzed.

CONCLUSION

Nidranasha can be managed well by Ayurvedic treatment modalities including diet and lifestyle modifications, drugs, *yoga* and *shirodhara*. Available clinical data is based on a small sample size; therefore there is a need for clinical trials with larger sample size. Future studies may be designed as randomized placebo controlled single or double blinded clinical trials with cross over design and an appropriate washout period to determine efficacy of Ayurvedic treatment in insomnia. Single herb or polyherbal formulation comprising of drugs enlisted in this review can be tested for their clinical efficacy in insomnia. Also black box design study can be undertaken to study holistic approach of Ayurveda evaluating its various arms of management strategies viz. *Ahara*, *Vihara*, *Achara*, *Panchkarma* and *Aushadh*. An epidemiological study estimating the prevalence of insomnia in *Vata*, *Pitta* and *Kapha* predominant *Prakriti* can be done so that risk factors can be established in reference to *Prakriti* of persons.

Conflict of Interest: None

Sources of support: None

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