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A Concept of Daytime Sleeping (Diwaswap) in Ayurveda in the Pathogenesis of Various Metabolic Disorders: A Scientific Approach

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ABSTRACT

Sleep is very important factor of human life which plays vital role for the maintenance of good health and well being throughout the whole life. Adequate sleep is essential for the protection of mental, physical and social health. But daytime sleeping may be the serious issue for good health. Not only sleep deprivation at night but also excessive daytime sleeping increases the risk of various metabolic disorders. Various studies have been shown bad effects of daytime sleeping. Prevalence of daytime sleeping is high in developed countries and urban areas. Incidences of metabolic disorders like obesity, Diabetes Mellitus, CVDs, hyperlipidaemia, increased in people who used to sleep at daytime. Daytime sleeping is mentioned in Ayurvedic classics as Diwaswap under the description of chapter Ashtaunidit (~metabolic disorders). It is not recommended regularly as it gives birth to various health issues due to vitiation of all the three Dosha which results in the production of Ama (~toxic undigested food matter). Ayurvedic literature clearly advocated avoiding daytime sleeping and it is only recommended in certain conditions. Daytime sleeping is responsible for the alteration in the circadian rhythm of the body which results in the change of various physiological processes and neuro-endocrine functions. Such changes account for the deposition of adipose tissues and release of certain inflammatory markers leading to various metabolic disorders.

KEYWORDS

Daytime sleeping, Circadian rhythm, Metabolic Disorders



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INTRODUCTION

Sleep is an incredible part of human routine and its importance is explained in ancient literatures as well as modern science. In *Ayurvedic* classics, *Aahar*(diet), *Nidra*(sleep) and *Bramhacharya*(chastity) are said as *Trayopastambha*¹ (Tripod of life) by virtue of which, life of human beings is maintained in equilibrium. Sleep (*Nidra*) is very important entity of them not only in humans but also in all animals too. Sleep is necessary to maintain that equilibrium among *Dosha* (~basis elements of human body constituted from Panchamahabhuta i.e., soil, water, fire, air and vaccum), *Dhatu* (~seven types of cellular tissues) and *Mala* (~excretory bio-products) for good health. It should be at proper time with adequate duration to function out various physiological processes normally. Now a day, in a modern technical era, occurrence of various metabolic disorders such as obesity, Diabetes Mellitus, hyperlipidaemia, myocardial infarcts, mood disorders, Metabolic Syndrome, etc. has been increased so much². Daytime Sleeping (*Diwaswap*) is one of the major factors responsible to cause various metabolic disorders. Daytime sleeping leads to pathologic disturbances of various metabolic processes which lead to various lifestyle

modification disorder known as metabolic disorders. So it has been proved that behavioral change in daily routine is needed to overcome these conditions and to improve quality of life.

PREVALENCE³

The prevalence of the daytime sleeping in the general population is difficult to estimate. This is partly due to the lack of a standardization for concept of daytime sleeping, with some studies asking people to estimate the severity of their daytime sleeping, others asking the number of days per week they used to experience sleeping and some others used the Epworth Sleepiness Score (ESS)⁴ to assess sleepiness. This score varies from 0 to maximum 24. American Sleep Foundation estimated 18% of the population on the basis of ESS while Japanese people found 2.5% and 8.7% population in US (by question-answer interaction) found to fall asleep during the daytime.

CONCEPT OF SLEEP (*NIDRA*) IN *AYURVEDA*

Sleep is very important physiological factor related to human health. When a person tires after his physical and mental routine work, sleep provides him regenerated energy to



perform that work with new efficiency. Various factors are dependent on sleep as health, nutrition, energy, potency, intelligence, etc⁵. Disturbances in time and its duration even for a single day show its effects during daily activities. One can feel lethargy, drowsiness, lack of interest and concentration in any work, lack of energy, headache, indigestion, hyperacidity, etc due to improper sleep.

TYPES OF SLEEP AS PER AYURVEDA

Different *Acharyas* (ancient teachers) have described different types of Sleep. But all of them have mentioned the same ideology irrespective of the types of sleep^{6,7}. The explanation of *Acharya Vagbhat* seems to be more descriptive and hence is mentioned as below⁸.

1. ***Kal-prabhava* (~Natural)**: This type of sleep is induced automatically at night. It is responsible for good health and stability of life.

2. ***Aamayakhed-prabhava* (~Disease induced)**: This type of sleep is induced due to pathological condition of various disorders.

3. ***Chittakhed-prabhava* (~Psychogenic)**: It is caused by various psychological factors extreme anger,

emotional stress, hurt by anyone, feeling sadness, fearful shock, etc.

4. ***Dehakhed-prabhava***

(~Exersional): This type is induced by excessive physical work such as exercise, weight lifting, various sports, singing, journey, attending various functions, watching excessive movies, etc.

5. ***Kapha-prabhava* (~ Adiposity induced)**: It is induced after taking heavy meal, habit of eating sweets, obese people, frequent eating habits, sedentary lifestyle, etc.

6. ***Agantuj* (~External factor induced)**: It is induced due to external application of various lepa, ointments, creams, oils, body massaging, tub bath, listening songs, etc. It can also be induced due to bad odors, toxic gases, some smells, ingestion of alcohol, medications, sedatives, anesthesia, etc.

7. ***Tamobhava* (~lethargy & negativity induced)**: This type of sleep is induced by Tamoguna (~quality of negativity) which is generated in human beings by certain constitutional, behavioral, dietary habitual, environmental and spiritual causes. It includes constitutional occurrence of Tamoguna by birth. Laziness, selfish thoughts, jealousy about people, disrespect to elders, sinful acts are some behavioral



factors. Dietary habits include eating junk foods such as bakery products, pizza, sandwiches, etc and also eating at open places, on roads, without sharing, full stomach eating are merely responsible. Person living in such environment surrounded by negative people, or at brothels, slaughterhouses, graveyards, etc. This one is responsible for pathogenesis of various metabolic disorders.

CONCEPT OF DAYTIME SLEEPING (*DIWASWAP*) IN *AYURVEDA*

Daytime sleeping is simple to understand as day time sleeping is very difficult to understand; why it causes various metabolic disorders. Sleep is mandatory for good health but daytime sleeping is not recommended in that sense. Root cause of pathogenesis is *Tridoshprakop* and *Amautpatti* (~accumulation of toxic undigested food matter).

CAUSATIVE FACTORS FOR DAYTIME SLEEPING

1. **Psychological cause:** Certain emotional disturbances in family due various stressful factors like family quarrels, arguments, financial crisis, etc are directly

or indirectly responsible for tiredness of mind which induces daytime sleeping.

2. **Sedentary lifestyle:** Habitual lack of physical exercise due to busy schedule, enforced work load, laziness, late night sleeping, late morning waking etc. are responsible for drowsiness, unenthusiastic feeling, obesity and sleepy.

3. **Dietary habits:** Dietary habits of eating more sweet dishes, chocolates, junk foods such as bakery products, pizza, sandwiches, etc. Multiple time eating habits, lack of fruits, green vegetables and fiber diet are also some factors which are indirectly induces adiposity and lead to *Diwaswap*.

4. **Age:** Old people or retired persons are free at home. They have no such physical work to do, so in these people sleep at noon. Small kids require more sleep by their physiological demand⁹.

5. **Sex:** Adolescent and middle aged females have hormonal changes in their body during puberty, menstruation, menopause, pregnancy, etc are responsible for daytime sleeping. House wives who are free from their routine after daily routine used to sleep at noon¹⁰.

6. **Socioeconomic Status:** People belonging to higher socioeconomic status prefer to sedentary lifestyle, living in



luxurious environment which indirectly lead them to daytime sleeping.

7. **Medications¹¹**: Certain medications are also responsible for daytime sleep such as benzodiazepines, barbiturates, anti-epileptics, alcohol, opiates, etc.

8. **Sleep fragmentation causes¹²**: Some conditions are observed to be responsible for disruption of sleep at night such as OSA (Obstructive Sleep Apnea), RLS (Restless Leg Syndrome), PLMD (Periodic Limb Movement Disorder), etc. OSA is the most common cause of daytime sleeping resulting from occlusion of upper airway during sleep which lead to intermittent hypoxia with resulting sleep fragmentation and disturbed sleep¹³.

9. **Sleep Deprivation¹⁴**: Some of the other sleep related causes which are responsible for diminished sleep at night are behavioral changes, circadian rhythm sleep disorder, altered sleep phase, etc.

10. **Certain Disorders¹⁵**: Neurological (Narcolepsy, Idiopathic hypersomnia, Parasomnia, Parkinsonism, Epilepsy, Stroke, Multiple Sclerosis, etc), psychological (mood disorder, depression, anxiety, Schizophrenia, etc) are other conditions which are responsible for daytime sleeping.

PATHOGENESIS OF METABOLIC DISORDERS BY DAYTIME SLEEPING

Daytime sleeping leads to cause disturbances in the equilibrium of *Dosha*, *Dhatu* and *Mala*. It leads to *Tridoshaprakop*(~alteration in circadian rhythm)¹⁶ which is a root cause in the pathogenesis of various disorders.

Vitiation of all of the three *Doshas* further lead to *Agnidushti*(~disregulation of digestive enzymes) which causes improper digestion of the food material which is further responsible for generation of *Ama*.

Or in other way, it can be said as food cannot be assimilated into micro permeable particles which are responsible for generation of adipocytes and storage of unutilized fats in the body on long term continuity of this process.

Adipocytes comprise the adipose tissues which are stored in the vascular beds, stromal compartment in the body, subcutaneous tissue, skeletal muscles, internal organs such as liver, kidney, heart, omentum¹⁷. This can be correlated as storage at various *Srotas* (~various channels) leading to *Srotavarodh* (~blockage of various channels).

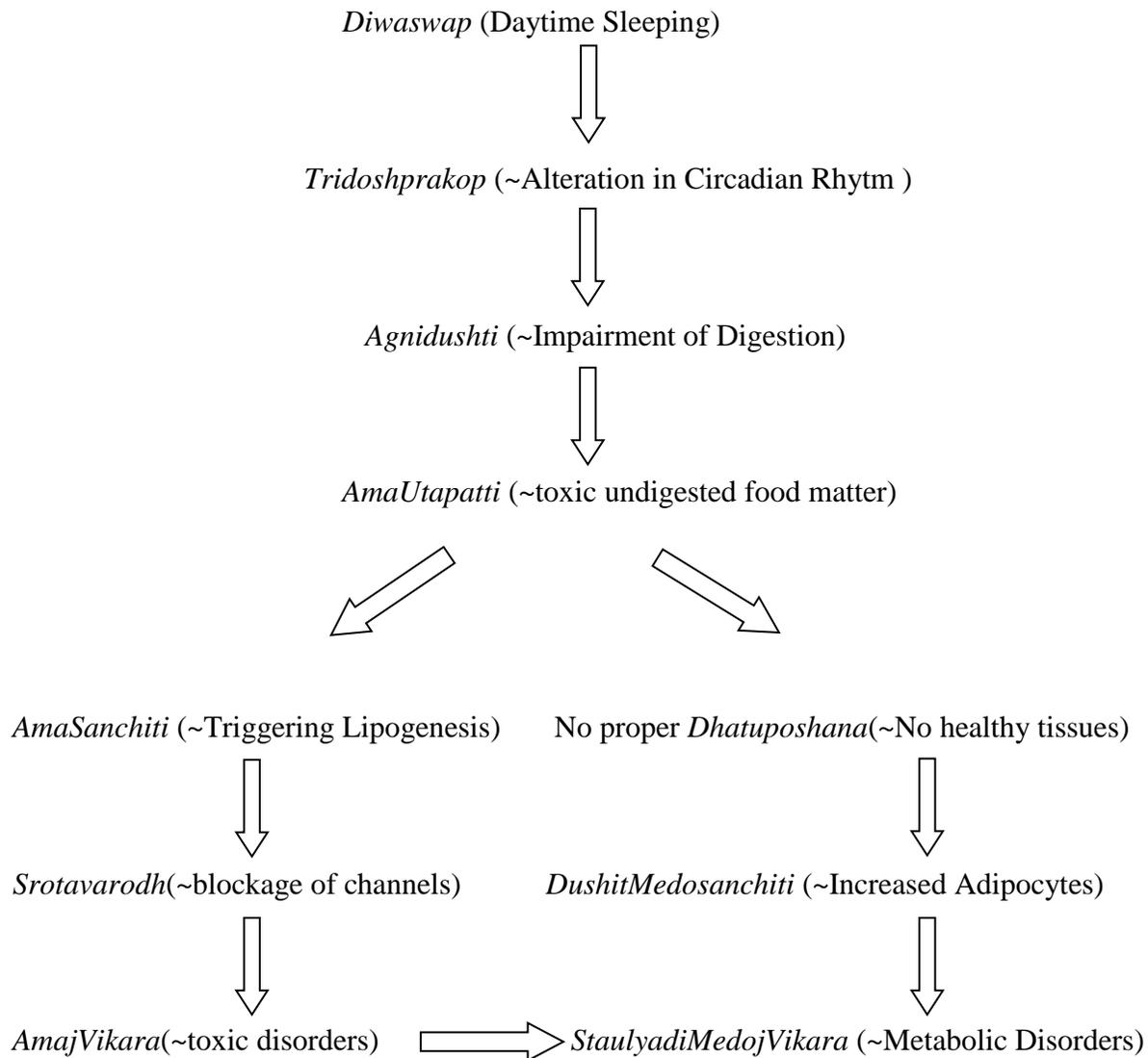
Adipocytes further release endocrine regulating molecules¹⁸. These molecules



include energy regulatory hormone (leptin), cytokines (TNF- α , interleukins), insulin sensitivity regulating agents (adiponectin, resistin, RBP4), prothrombotic factors (plasminogen activator inhibitor) and blood

pressure regulating agents (angiotensinogen). These metabolic changes are further responsible for various metabolic disorders.

Pathogenesis Flowchart Showing Development of Metabolic Disorders:



METABOLIC CHANGES BY DEPOSITION OF ADIPOCYTES¹⁹:

1. **Hyperinsulinaemia:** Increased level of insulin secreted in blood is a sign of obesity. Many obese people exhibit hyperglycemia or diabetes despite of high



insulin. This is due to state of insulin resistance consequent to unsensitization of tissues.

2. **Obesity:** It is the consistently linked factor with daytime sleeping²⁰. It is the result of metabolic disruption and chronic inflammation (probably due to TNF α and IL-6)²¹. Production and accumulation of adipose tissues with diminished utilization result in consequence of obesity.

3. **Type 2 Diabetes Mellitus:** Persist deposition of adipocytes often exacerbates incidences of Diabetes Mellitus.

4. **Hypertension:** Some studies show that hypertension is predominant in people who used to sleep at daytime. This may be probably due to adipocytes and lipoproteins exert pressure on vascular walls.

5. **Hyperlipidaemia:** It is subsequent of raised cholesterol and triglycerides associated increased lipogenesis due to daytime sleeping.

6. **Hyperlipoproteinaemia:** LDL and the VLDL are seen to be increased in the people having habit of daytime sleeping which further lead to cardiovascular incidences.

7. **Atherosclerosis:** Accumulation of fatty streaks containing WBCs, cholesterol and triglyceride leading to arterial wall

thickening is mostly seen as a result of daytime sleeping.

8. **Non alcoholic fatty liver disease (NAFLD):** Fatty storage contributes to development of NAFLD which may further progress to cirrhosis of liver.

9. **Cholelithiasis:** There is 6 times higher chances of developing gall bladder stones in people who prefer to sleep at daytime due to increased total body cholesterol.

10. **Hypoventilation syndrome:** This is characterized by hyper somnolence at both times (day and night) along with CO₂ retention and hypoxia eventually right sided heart failure.

11. **Rheumatoid Arthritis:** It is a condition occurs due to response of various inflammatory markers which are predominantly released in day time sleepers. Mostly middle aged housewives are seen to suffer from this condition.

12. **Carcinoma:** Some studies show that incidences of breast cancer, endometrium and that of prostate are higher in daytime sleeping people.

DISORDERS OF EXCESSIVE DAYTIME SLEEPING (Diwaswap)²²:



1. ***Halimak*²³(~complicated Jaundice):** A condition characterized by paleness, yellowishness of skin, low grade fever and diminished libido due to vitiation of *Vata* and *Pitta*.
2. ***Shirshool*(Headache):**This may be due interruptive awaking from slow wave sleep(deep sleep) and alteration of circadian rhythm.
3. ***Staimitya*(~Feeling of wetness):** It is due to diminished metabolism. It is reduced by 15% during daytime sleep²⁴.
4. ***Gurugatrata* (Feeling of Heaviness):** It is due to accumulation of *Ama* and its distribution to whole body which results in *Srotavarodh* (~blockage of various channels).
5. ***Angamarda* (Generalised bodyache):** This may be due to accumulation of fatty acids and lactic acid which lead to metabolic acidosis causing generalized body ache.
6. ***Agninash* (Loss of Appetite):**It may be increased secretion of leptin²⁵ by adipose tissues which acts on satiety centre. As per *Ayurvedic* science, *Amautpatti* lead to blockage of channels. This may cause inappropriate secretion of digestive secretions.
7. ***Hridaypralepa* (~Heaviness in chest):** It may be due increased blood flow to heart leading to increase blood pressure²⁶.
8. ***Shotha*(~Anasarca):** Accumulation of adipocytes and decreased metabolism lead to resultant increase in adipose mass which may further lead to release of certain inflammatory markers causing generalized edema. Chronic inflammation²⁷ is supposed to be mediated by TNF α and IL-6 and may be responsible for generalized edema.
9. ***Arochaka* (~Tastelessness):** Production of *Ama* in the body may be covering Gustatoreceptors present at tongue leading to diminish sensitivity of taste buds responsible for tastelessness.
10. ***Hrillas*(Nausea):**It is probably due to reflex of gastric irritation caused by accumulation of *Ama* and acid reflux from stomach to esophagus²⁸.
11. ***Pinas* (~Rhinitis):**It may be due to increased prostaglandins during daytime sleep.
12. ***Ardhavabhedak*(~Migrain without aura):** Probably due to release of serotonin (5HT₃)²⁹.
13. ***Kotha* (~Urticaria):** Due to release of certain histamines and adipokines.
14. ***Pidaka* (Papular eruptions):**It may be due to accumulation of *Sweda*(sweat) by



the blockage of *Swedavahasrotas*(~blocking of passage of sweat glands).

15. **Kandu (Itching):** Release of certain histamines during daytime causes itching.

16. **Tandra (Drowsiness):** During daytime sleep, inhibition of blood supply to brain lead to drowsiness. This may be happening due to inhibition of orexins³⁰ (a neuropeptide which is produced by hypothalamus helpful in wakefulness)

17. **Kasa (Cough):**This is probably due to aspiration of acid from stomach into trachea coming from stomach as a result of reflux of acid during lying position while sleeping such as in GERD.

18. **Galamaya (~Hypothyroidism):** It may be due to diminished metabolism and diminished synthesis of thyroid hormone by inhibition of thyrotrophic stimulating hormone (TSH) secretion by anterior pituitary³¹.

19. **Smiritinash (Dementia):**No exact reason for dementia is there. This occurs due to neurodegenerative changes in brain may be due to various interleukins or other cytokines.

20. **Buddhipramoh (~Dizziness):** Diminished blood supply to brain cells may result in dizziness.

21. **Srotavarodh(~blockage of body channels):** Accumulation of *Amacirculates*

in body through various channels. While circulating, it attaches particular areas forming certain complexes which block the various channels.

22. **Jwar(Fever):** It is due to trapping of temperature in the body due blockage of various channels by *Ama*.

23. **Indriya-asamarthya (~Sensory and Motor deficit):** This may be the advance stage of complications or disorders caused by long term habit of daytime sleeping. Perhaps this is due to slowly degeneration of neuro-muscular junctions or depletion in number of receptors for neurotransmitters mediated due to chronic inflammatory response.

INDICATIONS OF DAYTIME SLEEPING (*Diwaswap*)³²

1. **Singers:** Singing is responsible for provocation of *VataDosha* which exerts feeling of tiredness after singing.

2. **Studious person:** Continuous study is also responsible for provocation of *Vata*.

3. **Alcoholic:** It is compared with poison in *Ayurveda* due to resemblance in the properties of both. Exact mechanism is not known but possibly daytime sleeping might have counter effect on alcohol.

4. **Sexual activities:** It is a catabolic activity and utilizes lots of energy. So to



regain energy proper sleep is needed on the following day of intercourse.

5. **Thin people:** Lean and thin people require gaining of body mass. Daytime sleep helps in such conditions due to anabolism.

6. **Indigestion:** Indigestion is due to improper sleep of previous day and proper sleep helps to digest that food properly.

7. **Kshata (~externally torn off injuries):** Sleep is necessary for healing process of injury.

8. **Extreme Emaciation:** Sleep helps in regaining of body tissues

9. **Old people³³:** This is a stage of catabolism and degeneration of body tissues. Daytime sleep helps to slowdown this process.

10. **Children:** This is a growing age and requires more anabolic activities for building of body physique.

11. **Excessive Thirst:** Thirst centre is inhibited by daytime sleep which is present in the hypothalamus. It also helps to reduce insensible water loss from body by means of sweating, respiration, etc.

12. **Diarrhea:** After diarrhea, a person suffers from dehydration and electrolyte imbalance

13. **Pain(Abdominal/Generalized):** Pain occurs due to provocation of *VataDosh*a. Sleep is responsible to increase

*KaphaDosh*a by which Vata is inhibited and hence getting relief in painful condition.

14. **Shwas (~Breathlessness):** It causes weakening of lungs and respiratory muscles. Sleep helps in the recovery of efficiency of lung parenchyma.

15. **Hiccoughs:** Hiccoughs are arised as a result of diaphragmatic contraction. During sleep, diaphragm remains in a state of relaxation.

16. **External blunt trauma:** Trauma by falling from height causes inflammation of skeletal tissues and needs complete bed rest to heal it.

17. **Psychological disorders:** Serotonin hormone is secreted in GIT and is more during sleep. It is helpful for the maintenance of emotional factors and to maintain calmness of mind.

18. **Long Journey:** Journey lead to provocation of *VataDosh*a. Sleep inhibits it by virtue of *KaphaDosh*a.

19. **Late Night Workout:** Catabolism is increased due to more physical and mental work which requires more rest and anabolism. Daytime sleep helps in recovery.

20. **Emotional Factors:** Some emotional factors like anger, sadness, fearfulness,

21. **Habitual:** If someone is acclimatized for daytime sleeping without causing any side effect or disorders.



22. **Extreme summer:** This is a season of extreme temperature and may cause sun stroke. Water is also lost more through body. Sleep helps to reduce that loss.

DISCUSSION

None of the human beings can survive without sleep for longer duration as natural sleep is an anabolic stage of recovery and relaxant to human body. But daytime sleeping may cause critical health issues due to impaired anabolism and alteration of normal sleep physiology. There is very close relation of sleep, metabolism and circadian rhythm. Duration of night is reserved time for natural sleep. Circadian rhythm is known to control as well as modulate human physiological metabolic functions and human behaviour³⁴. It is known as endogenous clocks which organize the daily behavioral and physiological rhythms in accord with the external day-night cycle of human body³⁵. The suprachiasmatic nucleus (SCN) present in the hypothalamus is responsible for regulation of circadian rhythms in all organs³⁶. Daily pattern of energy metabolism (leptins, ghrelin, PYY, glucose, insulin, glucocorticoids, catecholamines, fatty acids, triglycerides) and its expenditure are regulated by circadian rhythm^{37,38}.

Alteration in the timing of sleep for longer duration i.e., daytime sleep can reflect the circadian alignment³⁹. Some studies have proved that circadian misalignment is involved in the alteration of neuro-endocrine physiology with the potential negative health issues as obesity, Diabetes Mellitus, CVDs and various metabolic disorders, etc⁴⁰. Energy expenditure and metabolism are reduced by 15% during daytime sleep. Reduced metabolism results in the production of adipocytes which promotes release of certain cytokines such as TNF α , IL-1b and IL-6. They are involved in physiological regulation of sleep but their secretion is supposed to be increased during daytime sleeping⁴¹. Such long term physiological variations are further responsible for various health problems.

CONCLUSION

Daytime sleeping alters the circadian rhythm of sleep which results in the alteration of various physiological metabolisms causing various health issues. So it is recommended to avoid daytime sleeping and to take normal sleep at night.



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