``

EFFECT OF SLEEP SPECIAL TECHNIQUE ON CHRONIC AUTO-IMMUNE DISORDER (DIABETES)

TOWARDS

Partial fulfillment of Master of Science in Yoga Therapy (MSc. YT)

Dissertation Submitted by

JAGJEET SINGH

Under the Guidance of

Dr. Sureshbabu

Dr. Rajesh S.K

Swami VivekananadaYoga AnusandhanaSamsthana

``

No.19, Eknath Bhavan, Gavipuram Circle, Kempegowdanagar,

Bangalore-560019 India.Website: www.svyasa.org

CERTIFICATE

This is to certify that JAGJEET SINGH who has got MSc registration with start from August 01, 2017 by Swami Vivekananda Yoga Anusandhana Samsthana, deemed University, has successfully completed the required training in acquiring the relevant background knowledge in Yoga Therapy and has completed the M.Sc. course of 2 years to submit this research project entitled "Effect of Sleep Special Technique On Chronic Auto-Immune Disorder(Diabetes): A randomized control study" as per the regulations of the University.

Dr. Sureshbabu (MD)

Assistant professor

S-VYASA University, Bangalore

Dr.Rajesh SK (Ph.D.)

Assistant professor

S-VYASA University, Bangalore

Date: May1, 2019

``

Place: Bangalore

DECLARATION

I hereby declare that the subjected study was conducted by me at Swami Vivekananda Yoga Anusandhana Samsthana (S-VYASA), Bangalore, under the guidance of Dr. SURESHBABU (MD) and co-guide Dr.RAJESH SK (Ph.D.) S-VYASA University Bangalore.

I also declare that the subject matter of my dissertation entitled "Effect of Sleep Special Technique on Chronic Auto-Immune Disorder (Diabetes): A randomized control study" has not previously formed the basis of the award of any degree, diploma, associate-ship, fellowship or similar titles.

DATE: **Jagjeet Singh**

PLACE: Bangalore **Candidate Name**

``

ACKNOWLEDGEMENT

A successful study requires guidance of who is expertise in that field. I would like to express my gratitude to the divine power, persons and all surroundings which guided and supported directly and indirectly throughout the tenure of the study.

I am extremely thankful to Swami Vivekananda Yoga Anusandhana Samsthana (SVYASA) for offering me the opportunity for preparing and completing the study and allowing to utilizing resources.

I am with whole heartedly thankful to my research guide Dr. Sureshbabu and co-guide Dr. Rajesh SK for their precious guidance while preparing the research. Their guidance has proved to be highly used and without them the study might not have been possible.

I am also thankful to Dr.Judu Illavarasu for making me to work independently and Padmasri Didi, Dr. Amit Singh and Dr.Ashwin Bilangi who supported with various aspects of this research.

I am also thankful to dear classmates MSCYT2017, MSCYT2019 and Arogyadhama participants for their co-operation, patience and support.

I would like to take this opportunity to extend our warm thoughts to my family and friends and whosoever helped me with their inspiration and support in making this research a wonderful learning experience.

``

ABBREVIATION

SLPD4	Sleep disturbance
SLPSNR1	Snoring
SLPSOB1	Sleep short of breath or headache
SLPA2	Sleep adequacy
SLPS3	Seep somnolence
SLP6	Sleep problems index I
SLP9	Sleep problems index II
FBS	Fasting Blood Sugar Level
PPBS	Postprandial Blood Sugar Level
PAID	Problem Areas in Diabetes
SSMOS	Sleep Scale from the Medical Outcomes
SLOC	Sleep Locus of Control

``

ABSTRACT

Title: Effect of Sleep Special Technique on Chronic Auto-Immune Disorder (Diabetes).

Background: Sleep determines many aspects of our life like mood, life-style changes, behavior etc. which is very much important for the people. Whereas, most of the sleep related problems are found in diabetic patients worldwide. There are previous studies, which show improvement in the quality of sleep by the practice of meditation and different types of yoga practices.

Aim: To evaluate the effect of sleep special technique on sleep quality of patients suffering from chronic Auto Immune disorders (Diabetes).

Methods and Materials: A total of 81 diabetic patients participated in the study and only 62 were able to successfully complete in the study. Those diabetic patients were randomly allocated into two groups, Experimental group n=32 and Control group n=30. Experimental group practiced one week of Sleep Special Technique and control group had not exposure to the technique during this period. Problem area in Diabetes (PAID), Sleep Scale of Medical Outcomes (SSMOS), Sleep Locus of Control Scale (SLOC), and a Visual Scale questionnaire were administered to the participants, before and after one week of SST for Experimental group and one-week gap was given for control group.

Results: After one week of SST result showed the significant improvement in PAID Score ($p<.001^{**}$), Sleep Locus of control part-1 ($p<.001^{**}$), and Sleep Locus of control part-2 showed no significant improvement, where as there is significant change in all domains of SSMOS Scale and Visual scale ($p<.001^{*}$) in experimental group compared to control group.

Conclusion: One week course of SST has a significant positive effect on overall sleep quality, quality of life and Life-style behavior in Diabetic Patients.

Key words: YOGA, SLEEP QUALITY, PAID, SLOC, SSMOS, VISUAL SCALE, DIABETES.

``

STANDARD INTERNATIONAL TRANSLITERATION CODEUSED TO TRANSLITERATE SANSKRIT WORDS

a	=	अ	ṅa	=	ङ	pa	=	प
ā	=	आ	ca	=	च	pha	=	फ
i	=	इ	cha	=	छ	ba	=	ब
ī	=	ई	ja	=	ज	bha	=	भ
u	=	उ	jha	=	झ	ma	=	म
ū	=	ऊ	ñ	=	ञ	ya	=	य
ṛ	=	ऋ	ṭa	=	ट	ra	=	र
ṝ	=	ॠ	ṭha	=	ठ	la	=	ल
e	=	ए	ḍa	=	ड	va	=	व
ai	=	ऐ	ḍha	=	ढ	śa	=	श
o	=	ओ	ṇa	=	ण	ṣa	=	ष
au	=	औ	ta	=	त	sa	=	स
ṁ	=	अ	tha	=	थ	ha	=	ह
ḥ	=	अः	da	=	द	kṣa	=	क्ष
ka	=	क	dha	=	ध	tr	=	त्र
kha	=	ख	na	=	न	jña	=	ज्ञ
ga	=	ग	gha	=	घ			

``

Contents

``

``

CHAPTER 1

INTRODUCTION

Sleep is one of the basic needs of human being. We spend about one-third of our life in sleeping. We all have experienced the feeling of being refreshed after sleep and the feeling of being fatigue after a poor sleep. In our busy life many of us are not getting the quality sleep needed to receive the healthy benefits of sleep. Sleep is a naturally occurring periodic state of rest of both mind and body, in which the eyes usually close and consciousness is completely or partially lost, with decreased bodily movement and decreased responsiveness to external stimuli (Anim & irdong, 2017). For decades sleep was considered as a passive or inactive part of our daily life. With the help of electroencephalography (EEG), electromyography (EMG), electro-oculography (EOG) many researches are done in sleep. Studies show that brain is active while we are sleeping and the quality of our sleep is very important for a good health. ("What is Sleep? Why is it needed?(Hirshkowitz et al., 2015a).

1.1.What is sleep?

Sleep is characterized by:

- It is a natural, periodic and reversible behavioral state.
- Inhibition of nearly all Voluntary muscles and Sensory activities.
- Reduced interactions with surroundings.
- Decreased ability to react to stimuli.
- Altered consciousness.
- Active brain.("Brain Basics: Understanding Sleep | National Institute of Neurological Disorders and Stroke", 2019)

1.2.Functions of Sleep:

As we all have experienced, the basic purpose of the sleep is to give rest to our body. It doesn’t mean that the whole body goes complete rest.("What Is Sleep? (Franken, Kopp, Landolt, & Lüthi, 2009)When we sleep, our body's systems are in an anabolic state. Sleep helps to restore

``

the skeletal, muscular, immune, nervous, and endocrine systems. These help to maintain cognitive functions (Fulda & Schulz, 2001)Endocrine system works efficiently during different stages of sleep.

- Good amount of sleep induces our Growth hormones, luteinizing and prolactine hormone in ladies to produce milk after childbirth
- There are two sleep centers in our brain which for sleep :

  Raphe Nucleus- It is situated in lower pons and medulla oblongata; it also releases serotonin by the nerve fibers and results in NREM sleep.

  Locus Cerulean of Pons- These center produces REM sleep, here non adrenaline released by the nerve fibers.
- Sleep is important for various aspects of brain functions like, concentration, cognition, performance and productivity.
- Sleeping less than 7-8 hours per night is linked to an increased risk of heart disease and stroke.
- The duration of sleep is largely dependent on age (Hirshkowitz et al., 2015a).

1.3 Sleep mechanisms:

Circadian rhythm and homeostasis are two internal biological mechanisms which regulate sleep and wakeful stages.

Circadian rhythms : Refer to the daily rhythms in physiology and behavior. The timing of our sleep in every night and the waking up from sleep every morning is controlled by these circadian rhythms. The rhythms are developed by neural structures in the hypothalamus that function as a biological clock (Dunlap et al., 2004).Circadian rhythms adjust with environmental cues (light, temperature) about the actual time of day, but they continue even in the absence of cues(Saper, Fuller, Pedersen, Lu, & Scammell, 2010)

Sleep-wake homeostasis: The homeostatic sleep drive reminds the body to sleep after a certain time and regulates sleep intensity. This sleep drive becomes stronger every hour you are awake and make you sleep for a long time and deeply after a period of sleep deprivation. Exposure to light, health conditions, sleeping environment, food habits, stress level etc. influence the sleep –

``

wake needs. Specialized cells in the retinas process light and inform the brain whether it is day or night and can advance or delay our sleep-wake cycle(Schwartz & Roth, 2009).

1.4 Parts of the brain involved in Sleep:

- **Hypothalamus:** contains groups of nerve cells that act as control centers affecting sleep and arousal. In hypothalamus there is suprachiasmatic nucleus (SCN). It has thousands of cells that collect information about light exposure directly from the eyes and control behavioral rhythm.
- **Brain stem:** communicates with the hypothalamus to control the transitions between wake and sleep. (The brain stem includes structures called the pons, medulla, and midbrain.) Sleep-promoting cells within the hypothalamus and the brain stem produce a brain chemical called *GABA*, which cut down the action of arousal centers in the hypothalamus and the brain stem. The brain stem (especially the pons and medulla) also plays a major role in REM sleep; it sends signals to relax muscles essential for body posture and limb movements, so that we don't act out our dreams.

- **Thalamus:** During most stages of sleep, the thalamus becomes silent, making you to ignore the external world. But during REM sleep, the thalamus is active, sending the cortex sounds, images, and other sensations that fill our dreams.

- **Pineal gland**: collects signals from the SCN and increases production of the *melatonin*, which helps to sleep once the lights go off.

- **Basal forebrain:** stimulate sleep and wakefulness, while part of the **midbrain** acts as an arousal system. Discharge of adenosine (a chemical by-product of cellular energy consumption) from cells in the basal forebrain and probably other regions supports sleep drive. Caffeine prevents sleepiness by blocking the actions of adenosine.

- **Amygdala**: Associate amygdaloid structure concerned in process emotions, becomes more and more active throughout paradoxical sleep. ("Brain Basics: Understanding Sleep | National Institute of Neurological Disorders and Stroke", 2019) (Hobson, 2005).

``

1.5 Stages of Sleep:

The structural organization of normal sleep is called Sleep Architecture. Sleep stages are measured electroencephalography [EEG], Electro-oculography [EOG] (eye movements), and electromyography [EMG](muscle activity). (Badr, 2019). The two stages of sleep are Non-Rapid Eye - Movement Sleep (NREM) and Rapid Eye - Movement Sleep (REM). NREM sleep is divided into 4 stages, NREM 1, NREM 2, NREM 3, and NREM 4. Each stages of sleep have unique characteristics shown in brain waves patterns, eye movements and muscle tone. An average length of a NREM – REM sleep cycle is approximately 90 to 120 minutes (Carskadon and Dement, 2005).A person goes through all the stages of sleep several times in a night. (Colten, Altevogt & Research, 2019).

NREM (Slow Wave Sleep): This is the phase when a person enters to the sleep. It takes approximately 90minutes. Dreams in this stage cannot be remembered (Badr, 2019).

NREM 1: This is a transition period from wakefulness to sleep. The person will be in light sleep and can be easily disturbed. Eyes move very slowly and muscle activity slows. This constitutes about 2 – 5 percent of total sleep.

NREM 2: This is the first stage of real sleep. Body temperature drops, breathing and heart rate begins to slow down. Sleep spindles and K complexes starts appearing. (Both are transient wave forms that are superimposed on a background of dominant theta activity. Sleep spindles are tripping curving waves of 12-14 cycle frequency that ar best captured on central graph leads. K-complexes are dysphasic waves that have a well-delineated sharp upstroke (negative) component, followed by a slow (down stroke) positive component. K-complexes also appear during transient arousals and in association with transient alpha waveforms.) It constitutes about 45 – 55 percent of total sleep episode.

NREM 3 and NREM 4: These stages are collectively called Slow Wave Sleep. Waves which are of low frequency (generally 0.5 to 2 Hz) and large amplitude (>75 μV) are called slow waves, delta waves. NREM 3 constitutes about 3 to 8 percent of sleep.

NREM 4 lasts approximately 20 to 40 minutes, and makes up about 10 to 15 percent of sleep. This is the deepest sleep. There is no eye movement or muscle activity. Heart beat and breathing

``

slow down to the lowest at this stage. Parasomnias (sleepwalking, sleep talking, bedwetting and night terrors) occur during the deepest stage of sleep. It is very difficult to awake someone during the last two stages.

REM sleep: This stage is also called paradox sleep (because of active CNS and paralyzed periphery) or desynchronized sleep (because of low-voltage, mixed-frequency brain wave activity). When one move to REM sleep, breathing becomes more irregular, heart rate and blood pressure increase to near waking levels, arm and leg muscles become temporarily paralyzed, brain wave activity becomes closer to that seen in wakefulness. Most of your dreaming occurs during REM sleep (Carskadon & Dement, 2011).

``

Stages of the Sleep Cycle

<table>
<tr><th></th><th>WAKE</th><th colspan="3">NREM SLEEP</th><th>REM SLEEP</th></tr>
<tr><td>Stage of Sleep:</td><td>Stage 0</td><td colspan="3"><table><tr><th colspan="2">LIGHT SLEEP</th><th>DEEP SLEEP</th></tr><tr><td>Stage 1</td><td>Stage 2</td><td>Stage 3</td></tr></table></td><td>Stage R</td></tr>
<tr><td>Description:</td><td>Eyes open, responsive to external stimuli, can hold intelligible conversation</td><td>Transition between waking and sleep. If awakened, person will claim was never asleep.</td><td>Main body of light sleep. Memory consolidation. Synaptic pruning.</td><td>Slow waves on EEG readings.</td><td>Brain waves similar to waking. Most vivid dreams happen in this stage. Body does not move.</td></tr>
<tr><td>Time Spent In:</td><td>16 to 18 hours per day</td><td colspan="3">4 to 7 hours per night</td><td>90 to 120 min/night</td></tr>
</table>

("Stages of Sleep - Non-REM and REM Sleep Cycles | Tuck Sleep", 2019)

``

1.6 Duration of Sleep:

Healthful sleep has been proven to be a very important factor for good health, better performance and growth and in predicting longevity. And yet we are a sleep-sick society, ignorant of the facts of sleep--and the price of sleep deprivation. National Sleep Foundation (NSF) has conducted research in the area of sleep with the aim of improving health and well-being through sleep health education and advocacy. Following Table represent the Age Specific Sleep Duration recommended by National Sleep Foundation. (Hirshkowitz et al., 2015b)

Recommended Sleep Duration by NSF

Age	**Recommended, hours**	**May be appropriate, hours**	**Not recommended, hours**
Newborns (0-3 months)	14 to 17	11 to 13 18 to 19	Less than 11 More than 19
Infants (4-11 months)	12 to 15	10 to 11 16 to 18	Less than 10 More than 18
Toddlers (1-2 years)	11 to 14	9 to 10 15 to 16	Less than 9 More than 16
Preschoolers (3-5 years)	10 to 13	8 to 9 14	Less than 8 More than 14
School-aged children (6-13 years)	9 to 11	7 to 8 12	Less than 7 More than 12
Teenagers (14-17 years)	8 to 10	7 11	Less than 7 More than 11
Young adults (18-25 years)	7 to 9	6 10 to 11	Less than 6 More than 11
Adults (26-64 years)	7 to 9	6	Less than 6

``

		10	More than 10
Older adults (≥65 years)	7 to 8	5 to 6 9	Less than 5 More than 9

1.7 Sleep Deprivation:

Sleep deprivation is a state of inadequate sleep which leads to deterioration of health and decreased performance. The person who is deprived of sleep will have a very poor quantity and quality of sleep over multiple nights. (Abrams, 2015). It can be chronic and acute. Sleep deprivation raise the risk of human error related accidents. Sleep deprivation degrades aspects of neuro-cognitive performance, increased compensatory effort is required to remain behaviorally effective and growing neglect of activities judged to be non-essential (Durmer, Ph, Dinges, & Ph, 2005). There are larger impacts of sleep deprivation on worry in adolescents and there is an increased vulnerability to elevated anxiety. Also, high school students with lower sleep times (7.5 h) shows higher levels of perceived stress, mood disturbance, suicidal ideation, unhappiness, interpersonal problems, poor perceived health, school absence due to illness and fatigue (Pilcher & Huffcutt, 2018).

- Sleep deprivation can cause pre-diabetes in healthy adults, in as little as 1 week. Many studies shows strong link between short sleep duration and type 2 diabetes risks.
- Poor sleeping patterns are strong linked to depression, particularly for those with a sleeping disorder.
- Sleep affects the body's inflammatory responses. Poor sleep is highly associated to inflammatory bowel diseases and can increase the risk of disease frequency.

Poor sleep affects our ability to identify important social cues and process emotional information.

``

1.8 Diabetes in women:-

In a study done in 1986, in United States of America shows that during six years, they found that women who are not able to follow normal and friendly to human system diet plan have faced health issues more. In addition alcohol, smoking and other drugs make serious impact on their health. But adding vegetarian and minimally refined form of grains consuming gives a great benefit to improve and maintain health and not having serious disorders like diabetes (Salmerón et al., 1997). Another study done in 1976 on Weight as a risk factor for clinical diabetes in Women, which shows there are certain reasons in women to get diabetes mellitus. Sedentary life-style is one of the cause. They found that after the age of 18, females BMI changes mostly. One reason is the hormonal changes at this age period. In addition if they adopt sedentary life-style, chances are more prone to catch diabetes mellitus (Colditz, Willett, Rotnitzky, & Manson, 1995). Another study on Prevalence of impaired glucose tolerance and diabetes in women with polycystic ovary syndrome indicates that there are more chances of impaired glucose tolerance in women associated with poor sleep (Ehrmann, Cavaghan, Barnes, Imperial, & Rosenfield, 1999). One more case control study of Inflammatory Markers and risks of developing type 2 diabetes in women was done in a women hospital at Boston, Massachusetts in 2004.which indicates significantly elevated CRP levels and other inflammatory markers as a sign before diabetes in pre-diabetic women population. (Hu, Meigs, Li, Rifai, & Manson, 2004). One more study on Dietary fat intake and risk of type 2 diabetes in women was published in 2001 in American journals, which shows that more intake of dietary fat or total fat may not have the significant proof. But regular secretion of fatty acid and trans fatty acid can reduce the risk factors of having diabetes 2 in women. The results were finalize in fourteen year based on the all reports (Salmerón et al., 2001).

1.9 The Future of Sleep Science:

Researchers continue to learn more about sleep. Understanding the sleep will give a better knowledge about brain as a whole. It helps to develop new ways or therapies to deal with sleep related disorders. We can expect that the sleep related researches will allow us to understand sleep's impact on our lives and provide us better tips for better sleep and thus better life.

("What is Sleep? Why is it needed? – American Sleep Association", 2019)

``

1.10 Sleep and Diabetes Mellitus:-

It is also believed that Diabetes mellitus affects the Sleep of a patient. The reason behind is because of Polyuria & Nocturia (Resnick et al., 2003).The common prevalence of fleshiness, high blood pressure, and disorders of metabolism in every illness is however one example. While the prevalence of sleep disorder with aldohexose intolerance or hypoglycemic agent resistance might gift sampling bias or intersection of common human diseases, an alternate hypothesis is that the events in clogging sleep disorder (OSA) trigger completely different, maybe distinctive, diversifications in metabolic processes involving hypoglycemic agent action and aldohexose regulation. Furthermore clinical studies can be designed to define the extent and potential mechanisms for alterations in insulin and glucose levels in OSA and to determine the sample size and power for a longitudinal study that may follow the relative rates of progression of avoirdupois (including neck size as a body characteristic), respiratory abnormalities throughout sleep, hypoglycemic agent sensitivity, and subsequent risk for non-insulin-dependent diabetes mellitus (NIDDM) and/or symptomatic OSA(Strohl, 2017).

It is also mentioned in some articles that, because of diabetes, sleep impairment have been frequently reported in elderly population. This association is also delineated as a vicious circle, wherever sleep disorders favors the event of sort a pair of polygenic disease or exacerbate the metabolic management of each sorts of polygenic disease, whereas polygenic disease itself, particularly once related to poor metabolic management, is often followed by sleep disorders (Touma & Pannain, 2011).

The impact of sleep impairment on polygenic disorder, and also the impact of polygenic disorder on the event or exacerbation of sleep disorders caught to result in potential new therapeutic strategies for treating both conditions(Barone & Menna-Barreto, 2011).

1.11 Need for the Study:

Although there are some researches on sleep, but this research shows that practice of Sleep Special Technique can improves sleep quality. However, extremely limited amount of data are available to show that whether these benefits of yoga in diabetes (Sahay, 2007a).

``

Therefore, there is a need of study on this topic in order acquire necessary evidences, on how yoga works in improving sleep quality and other sleep disorders like insomnia.

``

CHAPTER 2

Literature Review

Ancient Literature

Sleep

- Sleep is a desire less and dreamless state where thought and thought processes are Absent. In a deep state of sleep, there be no thoughts in the mind and one should experience nothingness or void.

Methodology of study

There were different texts which have given many informations about the sleep, stress, Ujjayi Pranayama and Bhramari Pranayama. The ancient texts referred are as follows-

- Mandukya Upanishad
- Patanjali Yoga Sutras
- Charaka Samhita

Stress

- Srimad Bhagavatam
- Bhagavad Gita
- Patanjali Yoga Sutras

Nadi shodhana Pranayama

- Hatha Yoga Pradipika

Ujjayi Pranayama

``

- Hatha Yoga Pradipika

Bhramari Pranayama

- Hatha Yoga Pradipika

Mandukya Upanishad

- Upanishads are the treasure of knowledge. Mandukya Upanishad is the most difficult and smallest Upanishad among all the hundred and eight Upanishads, which comprises only twelve passages. It talks about an entire range of human consciousness beginning from thewalking state and ending with the super conscious state.
- According to Upanishads- Sleep is a state of mind. व्युत्थना (Waking), and dreaming are other two states and a common man's mind keeps switching between these 3 states. The yogi through practice reaches the fourth state – तूर्या. **(mandukya upanishad)**

सर्वं ह्येतद् ब्रह्म अयमात्मा ब्रह्म सोऽयमात्मा चतुष्पात् ॥२॥

sv aetd āymaṭma saeymaṭma ctupat।2।

- Every objects in this creation are nothing but Brahman. It is not only objective existence but the subjective self within (*Atman*) is also *Brahman*. Objective existence is nothing but an emanation of the Reality, which is present behind the subject. This Reality manifest in the subject in four conditions – walking state (*jagrit*), dreaming state (*swapna*), deep sleep (*sushupti*), super – consciousness / transcendent state (*turiya*).

zagrit –

जागरितस्थानो बहिःप्रज्ञः सप्ताङ्ग एकोनविंशतिमुखः स्थुलभुग्वैश्वानरः प्रथमः पादः ॥३॥

jagirtṣvanae bih sa kaenivzitmuo ṣvuluġvanr vm pad।3।

``

The first aspect of atman is self in the waking state "Vaishvanara". In this state, consciousness is turned outward to the external world. Through its 7 instruments & 19 channels, it experiences the gross objects of the world.

ṣvapna -

स्वप्नःस्थानोऽन्तः प्रज्ञः सप्ताङ्ग एकोनविंशतिमुखः प्रिविविक्तभुक् तैजसो द्वितीयः पादः ॥४॥

ṣvṣvanaeṇt sa kaenivzitmuo iivivuk tjsae itīy pad।4।

The second aspect of Atman is self in the dreaming state "Taijasa". In this state, consciousness is turned towards the inner world. Through 7 instrument and 19 channels, which engage the subtle objects of the mental realm.

suṣupti –

यत्र सुप्तो न कंचन कामं कामयते, न कंचन स्वप्नं पश्यति, तत् सुषुप्तम्।

सुषुप्तस्थान एकीभुतः प्रज्ञानघन एवानन्दमयो ह्यानन्दभुक् चेतोमुखः प्राज्ञस्तृतीयः पादः ॥ ५॥

y suae n kcn kam kamyte n kcn ṣv pṣyit tt suum
suuṣvan kīut ann vanṇdmyae anṇduk cetaemuo aṣttīy pad। 5।

The third aspect of Atman is self operating in the deep sleep state "Prajna". In this state, there is neither the desire of any gross or subtle object, or any dream sequences. In deep sleep, all such experiences have merged into the ground of undifferentiated consciousness.

एष सर्वेश्वर एष सर्वज्ञ एषऽन्तर्याम्येष योनिः सर्वस्य प्रभवाप्ययौ हि भुतानाम्॥६॥

sveřr svř ṇtyařṁye yaein svřṣy vayya ih utanam।6।

This is the Lord of All : the Omniscient, the inner controller, source of everything, this is the beginning and end of the all.

Turiyā –

नान्तःप्रज्ञं न वहिःप्रज्ञं नोभयतःप्रज्ञं न प्रज्ञानघनं न प्रज्ञं नाप्रज्ञम्।

``

naṇt n vih naeyt n ann n nam

अदृष्टमव्यवहार्यमग्राह्यमलक्षणमचिन्त्यमव्यपदेश्यमेकात्मप्रत्ययसारं प्रपञ्चोपशमं शान्तं शिवमद्वैतंचतुर्थं मन्यन्ते स

आत्मा स विज्ञेयः ॥७ ॥

āmyvhayřmamlmicṇṭymypdeṣymekaṭmṭyysar paepzm zaṇt izvmtctuv mṇyṇte s

āaṭma s ivey|7|

The fourth aspect of Atman or self is "Turiya". In this stat, consciousness is neither turned inward nor outward. It is beyond both cognition and absence of cognition. Turiya state cannot be experienced through senses, deductive reasoning , it is unthinkable with the mind & indescribable consciousness itself. This is pure consciousness itself, the real self.

- Chapter 8.7 through 8.12 of chandogya Upanishad discuss the four states of consciousness as wake , dream filled sleep, deep sleep and beyond deep sleep.

Physiology of sleep

- In charaka samhita nidana sthana, it is mentioned about sleep and diabetes as-

तमोभवा श्लेष्म समुद्भवा च मनः शरीरं श्रमसंभवा च ।

आगंतुकी व्याध्यानुवर्तिनी च रात्रिस्वभाव प्रभवा च निद्रा ॥ च सू ।२१ ।५८ ॥

tamobhavä çleñma samudbhavä ca manaù çaréraà çramasambhavä ca|
ägantuké vyädhyänuvartiné ca rätrisvabhäva prabhavä ca nidrä|| ca sü|21||

``

Charaka Samhita explained about the six types of sleep, they are as follows

1. Tamobhava nidra - the sleep happening due to predominant of tamoguna in mind.
2. Clenmasamudbhava nidra – the sleep happening due to excess kapha dosha in the body.
3. Cramasambhava nidra – state of sleep due to tiredness in both mind and body.
4. Agantuki nidra – sleep due to the injury to the body.
5. Vyadhyanuvartine nidra – sleep due to particular diseases.
6. Ratrisvabhavaprabhava nidra – the sleep which we are getting daily at night.

3. <u>Effects of sleep</u>

Nidrā

In Charaka Samhita acharya Charaka mentioned merits and demerits of sleep.

निद्रायन्तं सुखं दुःखं पुष्टिः कार्श्यं बलाबलम्।

वृषता कलीवता ज्ञानमज्ञानं जीवितं न च ॥ च सं २७ ।३६ ॥

अकालेऽतिप्रसङ्गाच्च न च निद्रा निषेविता ।

सुखायुषी पराकुर्यात् कालरात्रिरिवापरा ॥ च सं २७ ।३७ ॥

nidräyantaà sukhaà duùkhaà puñöiù kärçyaà baläbalam|
våñatä kalévatä jïänamajïänaà jévitaà na ca|| ca saà 27|36||
akäle'tiprasaìgäïca na ca nidrä niñevitä|
sukhäyuñé paräkuryät kälarätririväparä|| ca saà 27|37||

- Dependent of sleep are happiness and misery, corpulence and leanness, strength and weakness, potency and impotency, intellect and non intellect, life and death. Sleep observed untimely, excessively and negatively takes away happiness and life like the other death night. The same, if properly observed, provides happiness and life like the flashed true knowledge providing accomplishment to a Yogi.

देहव्रुतो यथाहारस्तथा स्वप्नः सुखो मतः ।

``

स्वप्नाहारसमुत्थे च स्थौल्यकार्श्ये विशेषतः ॥ च सं २१ ।५१ ॥

dehavruto yathaaahaarastathaa swapnaH sukho mataH .
swapnaahaarasamutthe cha sthaulyakaarshye visheShataH.. ca saà 21|51||

As wholesome diet is needed for maintenance of the body so is the sleep. Obesity and leanness are particularly caused by sleep and diet.

एत एव च विज्ञेया निद्रानाशस्या हेतवाः ।

कार्य कालो विकाराश्च प्रकृत्तिर्वायुरेव च ॥ च सं २१ ।५७ ॥

eta eva cha viGYeyaa nidraanaashasyaa hetavaaH.
kaarya kaalo vikaaraashcha prakruttirvaayureva cha.. ca saà 21|57||

- Purgation, evacuation of head, emesis, fear, anxiety, anger, smoking, exercise, bloodletting, fasting, uncomfortable bed, predominance and satva and subduing tamas – these check the unwholesome and excessive occurrence of sleep. These very factors may be taken as causes of insomnia, along with overwork, time (old age) , disorder (vatika) constitution (vatika) and aggravation of vata itself.

निद्रायत्तं सुखं दुखं पुष्टिः काश्र्य बलाबलम् ।

व्रुषता क्लीबता ज्ञानं अज्ञानं जीवितं न च ॥ अ ह सु ०७ ।५३ ॥

nidraayattaM sukhaM dukhaM puShTiH kaarshya balaabalam.
vruShataa kliibataa GYaanaM aGYaanaM jiivitaM na cha.. a ha su 07.53..

``

Happiness and unhappiness, proper nourishment or emaciation, strength and debility, sexual powers and impotence, knowledge and ignorance, life and its absence (death) – all are dependent on sleep. 53.

अक्काले अप्रसङगाच्च न च निद्रा निषेविता ।

सुखायुषी पराकुर्यात् कालरात्रिरिवापरा ॥ अ ह सु ०७ ।५४ ॥

akkaale aprasaDagaaccha na cha nidraa niShevitaa.

sukhaayuShii paraakuryaat kaalaraatririvaaparaa.. a ha su 07.54..

Akaala nidra – sleep at improper time,

Atiprasanga – excess sleep,

Na nidra – lack of sleep.

The above three destroys the health.

Patanjali yoga sutra -

आभाव प्रत्यय आलम्बन वृत्ति निद्रा ॥

āaav ṭyy āalmbn vi ina।

-Sleep is a modification of mind, when awareness is absent . Patanjali listed five modification of mind to be real, unreal, fantasy, sleep and memory.

प्रमाण विपर्यय विकल्प निद्रा स्मृतयः ॥ प यो सु १ ।६ ॥

ma ivpyřy ivkḷp ina ṣmty। p yae su 16।

Patanjali explained five modifications of mind (vritti), they are right knowledge, misconception, verbal delusion, sleep & memory.

``

Caraka saṁhitā –

यदा तु मनसि क्लान्ते कर्मात्मानः क्लमान्विताः।

विषयेभ्यो निवर्तन्ते तदा स्वपिति मानवः॥ च सं २७।३५॥

yda tu mnis aṇte kmařṭman maiṇvta
ivyeyae invtřṇte tda ṣvipit manv। c s 27,35।

- When body and mind is disturb with the action, the mind become incapable to focus on action & the sense organs also getting tired because of too much work load. Which results, body going into sleep.

CARAKA SAṀHITĀ, ṇīḍāṇā ṣṭḥāṇā.

(Ch.4)

□□
□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□; □□□□□□-
□□
□□□□□□□□□□□□□ □□□□□□□□□□□□□□□□□□□□□□□□□□□□□,
□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□,
□□□□□□□□□□□□□□□□□□□□□□□□□□□,□□□□□□□□□□□□□□□□□□□□□□
□□□□□□□□□□□□□□□□□□□□□□□□,
□□□,
□□□□□□□□□□□□□□□□□, □□□□□□□□□□□□□□□□□□□□,
□□,
□□□□□□□□□□□□□□□□□‖□‖ **(SL.5)**

tatrēmē trayō nidānādiviśēṣāḥ ślēṣmanimittānāṁ pramēhāṇāmāśvabhirnirvr̥ttikarā bhavanti; tadyathā-
hāyanakayavakacīnakōddālakanaiṣadhētkaṭamukundakamahāvrīhipramōdakasugandhakānāṁ navānāmativēlamatipramāṇēna cōpayōgaḥ, tathā sarpiṣmatāṁnavaharēṇumāṣasūpyānāṁ,

``

grāmyānūpaudakānāṁ ca māṁsānāṁ,
śākatilapalalapiṣṭānnapāyasakṛśarāvilēpīkṣuvikārāṇāṁ,kṣīranavamadyamandakadadhidravamadhurataruṇaprāyāṇāṁ cōpayōgaḥ, mṛjāvyāyāmavarjanaṁ, svapnaśayanāsanaprasaṅgaḥ, yaśca kaścidvidhiranyō'piślēṣmamēdōmūtrasañjananaḥ, sa sarvō nidānaviśēṣaḥ||5||

TatrayonidAnAdivisheShAHshleShmanimittAnAMpramehANAmAshvabhirnirvRttikarAbhavanti;tadyathAhAyanakayavakacInakoddAlakanaiShadhetkaTamukundakamahAvrIhipramodakasugandhakAnAMnavAnAmativelamatipramANenacopayogaH,
tathAsarpiShmatAM navahareNumAShasUpyAnAM,grAmyAnUpaudakAnAMcamAMsAnAM,
shAkatilapalalapiShTAnnapAyasakRusharAvilepIkShuvikArANAM,
kShIranavamadyamandakadadhidravamadhurataruNaprAyANAM
copayogaH,mRujAvyAyAmavarjanaM,svapnashayanAsanaprasa~ggaH,
yashcakashcidvidhiranyo~apishleShmamedomUtrasa~jjananaH,sa sarvonidAnavisheShaH||*5*||

.

An excessive intake of *kapha*-vitiating food articles or lifestyle activities contributes to severe manifestations of *kaphaja prameha*. The following are some of the specific etiological factors for the *kaphaja* variant of this disease:

Frequent and excessive intake of:

- Newly harvested grains like *hayanaka*, *yavaka* (a variety of Hordeum vulgare Linn), *cinaka*, *uddalaka,naishadha,itkata, mukundaka, mahavrihi, promodaka*, and *sugandhaka*;
- Newly harvested pulses like *harenu* (Pisum sativum Linn.) and *masha* (Phaseolus radiates Linn.), consumed with ghee;
- The meat of domesticated, marshy and aquatic animals;
- Vegetables, *tila* (Sesamum indicum Linn.) oil, cakes of *tila*, pastries, *payasa* (milk-based pudding), *krisara* (gruel prepared of *tila*, rice, and black gram), *vilepi* (a type of thick gruel), and sugarcane-based food preparations;
- Milk, new wine, immature curd (curd which is mostly liquid and sweet);

``

- Various dietary regimen that produces excess *kapha*, fat, and urine;

Lifestyle related activities, including

- Avoidance of physical exercise; and
- Excessive sleep, bed rest and sedentary habits.

इक्षुविकाराणां क्षीरनवमध्यमन्दकदधिद्रवमधुरतरुणप्रायाणां चोपयोगः म्रूजाव्यायामवर्जनं

स्वप्नाशयनासनप्रसग्ङः यश्चकश्चिद्विधिरन्योपिश्लेश्ममेदोमुत्रसान्जननः स सर्वो निदानविशेषः च सं नि

०४ ।०५ ॥

ixuvikaaraaNaaM ,xiiranavamadhyamandakadadhidravamadhurataruNapraayaaNaaM chopayogaH , mrUjaavyaayaamavarjanaM, swapnaashayanaasanaprasag~NaH , yashchakashchidwidhiranyopishleshmamedomutrasaanjananaH sa sarvo nidaanavisheShaH ca saà ni 04|05||

The three factors Nidra etc., cause immediate manifestation of Prameha due to Kapha. Such as in excessive quantity and prolonged use of new grain like yavaka, cinaka, uddalaka, itkata, mukundaka and sugandhaka ; use of new legumes like harenu and black gram, meat of domesticated , marshy and aquatic animals, vegetables , preparation of flour , payasa , karsara, vilepi and sugarcane products, milk, fresh wine, immature curd and liquids, sweets and fresh substances ; abstinence from cleanliness and physical exercise, indulgence in sleep, lying down and sitting, and also similar regimens producing kapha, fat and urine. All these constitutes particularly etiology (of kaphaja prameha).

बहुद्रवः श्लेष्मा दोषविशेषः ॥ च सं नि ०४ ।०६ ॥

bahudrawaH shleShmaa doShavisheShaH.. ca saà ni 04|06||

The particular dosha is kapha consisting of abundant fluid.

``

.....माधुर्यमास्यस्य …षटपदपिपीलिकाभिश्च शरीरमुत्राभिसरणं… निद्रां तन्द्रां च

सव ंकालमिति ॥ ॥ च सं नि ०४ ।४७ ॥

…..maadhuryamaasyasya, …..ShaTapadapipiilikaabhishcha, shariiramutraabhisaraNaM, ….nidraaM, tandraaM, cha sarvakaalamiti.. ca saà ni 04|47||

The three doshas vitiated and about to produce pramehas exhibit these prodromal symptoms such as matting of hairs , sweetness of mouth, numbness and burning sensation in hands and feet, dryness in mouth , palate and throat, thirst, lassitude, dirt in the body, smearing of body orifices, burning sensation and numbness in body parts , crawling of bees and ants on the body and urine, morbidities in urine , flashy smell in body, frequent sleep and drowsiness.

TYPES OF PRAMEHA:

उदकमेह	इक्षुवालिकारसमेह	सान्द्रमेह	सान्द्रप्रसादमेह	सुरामेह
शुक्लमेह	पिष्टमेह	शुक्रमेह	शीतमेह	सिकतामेह
शनैमेह	आलालमेह	लवणमेह	फेनमेह	क्षारमेह
कालमेह	नीलमेह	लोहितमेह	शोणितमेह	रक्तमेह
मञ्जिष्ठमेह	हारिद्रमेह	अम्लमेह	वसामेह	मज्जामेह
सर्पिमेह	हस्तिमेह	मधुमेह	क्षौद्रमेह	

KAPHAJA PRAMEHA

``

CHARAKA	SUSHRUTA	VAGBHATTA
1. *Udakameha*	*Udakameha*	*Udakameha*
2. *lkshuvalikameha*	*lkshuvalikameha*	*lkshumeha*
3. *Sandrameha*	*Sandrameha*	*Sandrameha*
4. *Sandraprasadameha*	*Surameha*	*Surameha*
5. *Suklameha*	*Pistameha*	*Pistameha*
6. *Sukrameha*	*Sukrameha*	*Sukrameha*
7. *Sitameha*	_____	*Sitameha*
8. *Sikatameha*	*Sikatameha*	*Sikatameha*
9. *Saneimeha*	*Saneimeha*	*Saneimeha*
10. *Alalameha*	_____	*Lalameha*
11. _ _____	*Lavanameha*	…….
12. _____	*Phenameha*	……..

PIITAJA PRAMEHA

CHARAKA	SUSHRUTA	VAGBHATTA
1. *Kharameha*	*Kharameha*	*Kharameha*
2. *Kalameha*		*Kalameha*
3. *Nilameha*	*Nilameha*	*Nilameha*
4. *Lohitameha*	*Shonitameha*	*Raktameha*
5. *Manjisthameha*	*Manjisthameha*	*Manjisthameha*
6. *Haridrameha*	*Haridrameha*	*Haridrameha*

``

7. ..... *Amlameha*

VATAJA PRAMEHA

CHARAKA	SUSHRUTA	VAGBHATTA
1. *Vasameha*	*Vasameha*	*Vasameha*
2. Mazrameha	*Mazzameha*	*Mazzameha*
3. Hastimeha	*Hastimeha*	*Hastimeha*
4. Madhumeha	*Kshaudrameha*	*Madhumeha*

``

CHAPTER 3

Scientific Literature Review

Diabetes and sleep:-

It is found in couple of studies of Diabetes and Sleep Disturbance that a person's sleep is affected by diabetes. It is connected with periodic breathing; a respiratory abnormalities connects somewhere in the central control system of ventilation in human body. Also some sleep disturbances may result from diabetes through the hurtful effects of diabetes on central control of respiration (Resnick et al., 2003). Also it is a one of the main risk factors of short sleep ,in the study of Sleep duration risk factor for diabetes Type 2 (Beihl, Liese, & Haffner, 2009). In one more study, results shows that there are evidence of the connection between diabetes and sleep apnea. Some common factors for this connection could be because of the resistance of insulin. According to the study it indicates that because of the resistance of insulin , it targets biological structure of insulin and affects somehow the sleep quality of a diabetic person (Strohl, 2017). In diabetic patients one major thing is common that is obesity, in many cases hypertension is a cause too. Because of this in later-on stage body cells stop responding and this state is known as insulin sensitivity. so it clearly indicates that diabetes have impact on sleep (Yaggi, Araujo, & McKinlay, 2006). A study on women were done during the time period between (1986-1996) duration of 10 years that shows clearly about relation of sleep with diabetic women. Similar results came out from the study of Self-Reported Sleep Duration and Incident Diabetes in Women, which indicates that diabetes made impact on the short sleepers(>5) as well as on long sleepers(<9) and also increase the risk for developing of symptomatic diabetes (Ayas et al., 2003).

Diabetes and behavioral changes:-

In a study on diabetes educator: trying hard, but must concentrate more on behavior, indicates that a diabetic person develops some changes in his behavior. Diabetes make impact on the psychological state of mind. But via proper knowledge, self-efficiency and empowerment plays a vital role for them. In-fact changing their attitude towards diabetes shows nice results to improving anxiety, depression and stress (Knight, Dornan, & Bundy, 2006). In-fact according to

``

some other studies it indicates that with proper knowledge , family support and implementation plays a vital role among diabetes patients . In addition their behavioral change can be examine by having positive attitude towards diabetes and the life journey becomes normal like before as it was (Harvey & Lawson, 2009). Although in a study of social support and self-management behavior among diabetes 2 patients tells that by the good positive social support, health promoting behaviors shows substantial results (Schiøtz, Bøgelund, Almdal, Jensen, & Willaing, 2012). Another study of social support in diabetes, a systematic review indicates that a person's behavior depends on the ambiance where he/she is living. If a person gets negative feedback from the society, the chances are prone to impact on psychic level. In the opposite, if diabetic patient get positive feedbacks from the society, have a good impact on him/her. Also family should be supportive attitude towards their disorder/disease. By the proper knowledge and implementation it's not a burden on patient, in-fact he/she will be confidant and motivated always to live and involve in day to day activities open heartily (Schiøtz et al., 2012). Another study on changes in sexual behavior indicates that if a person is prone to insulin resistance, there are chances of low immunity too. It may make impact on other health issues as well as sexual life is also affected (van Griensven, de Vroome, Goudsmit, & Coutinho, 2009). One more study about cognitive-behavioral pedometer-based group intervention on physical activity and sedentary behavior in individuals with type 2 diabetes shows the results that yes it affects the cognitive behavior of diabetic patients. So by the proper knowledge, changes in sedentary life-style is necessary to make in day to day life (De Greef, Deforche, Tudor-Locke, & De Bourdeaudhuij, 2010).

Yoga & Anxiety, Life style & Behavioural Changes:-

A group based program of twelve month intervention was conducted in the cluster areas of Kerala state in the year of 2016-17, in which various proper lifestyle regarding knowledge and activities were done in fifteen sessions. On the basis of results 55 percent people reported the intervention is very useful. It was found feasible and acceptable in changing life-style behaviors in high-risk individuals. Evaluation was done by Re-AIM and pipe framework (Aziz et al., 2018). Another study on effect of yoga based lifestyle intervention on state and trait anxiety was done by all India medical institutes in 2003. In which 175 subjects were taken between the age group of 19-76 years .Various things like anxiety, depression, diabetes and obesity were

``

checked. Results indicates that on anxiety, lifestyle changes and behavioral have improved in patients it shows significant results (Gupta, Khera, Vempati, Sharma, & Bijlani, 2006). Another study of systematic review of controlled trials were done on yoga for adults of diabetes 2 . Strong evidences were presented that yogic practices are very helpful in diabetes cases. Also indicates how much effective yogic practices are in diabetes management, in addition to regulate the sleep, autonomic functions, mood and quality of life (Innes & Selfe, 2016).

Yoga & management of Diabetes and its complications:-

In a recent study of Yoga as a Complementary Therapy for Adults with Type 2 Diabetes, describes that in the management of type 2 diabetes, yogic practices are very helpful. A 12 week study of weakly 2 classes was done in two different groups. One was given Iyenger yoga and other group was given traditional exercises like stationary cycling and walking etc, with third and sixth month post intervention (Thind et al., 2018). One more study have shown the similar outcomes too that how much effective are yogic practices in maintaining and controlling type 2 diabetes in adults (Bock et al., 2019). Another randomized controlled pilot study indicates the positive outcomes of yoga practices in type 2 diabetes. In Indian culture yoga is very common. In addition, it was found that psychological well being, changes in anxiety, positive and negative affects and depression's outcomes are very positive (McDermott et al., 2014).

Yoga & Sleep:-

A recent published study done in SVYASA university, Prashanti kutiram Association between a guided meditation practice, sleep and psychological well-being in type 2 diabetes mellitus patients shows positive outcomes. Anxiety, perceived stress, sleep and quality of life was examined in type 2 diabetes patients with the intervention of CM (self-awareness based guided meditation practice). After the four week intervention, it was measured that CM is a effective practice for improving quality of life as well as for sleep quality. In addition day time dysfunction is reduced and overcoming from depression and anxiety too, plus it is a very safe practice (Varghese, Balakrishnan, & Pailoor, 2018). Another study of Effect of yoga and aerobics exercise on sleep quality in women with Type 2 diabetes was done to check the sleep quality of women having type 2 diabetes. Results shows that yogic practices are more helpful

``

and beneficial rather than aerobics exercises. In addition flexibility also improves after twelve week intervention (Ebrahimi, Guilan-Nejad, & Pordanjani, 2017).

Yoga and Diabetes :-

Ayurveda, the Indian traditional medicine system, has mentioned diabetes. The texts book such as Sushruta Samhita and Charaka Samhita give importance to the exercise and diet in managing the diabetes. Yoga as a intervention has been used in many researches related to diabetes and it has shows the positive results in reducing the levels of fasting and postprandial blood glucose, lowering the requirements in drugs usage and reducing the acute co-morbidity conditions, as well as the ability to maintain the glycogenic for a longer periods. Moreover, the amount of insulin receptors has increased and insulin sensitivity condition gets improved so that insulin resistance declined. In conclusion, yoga brings positive effect in diabetes management in short term and long term (Sahay, 2007b).

Practice of yoga asana along with diet management and drugs can be more improvements in managing DM 2. Significant deduction of waist-hip ratio and insulin level changes has been found which shows yoga asana works on utilization of glucose and redistribution of fat. In same study, blood glucose levels of one hour postprandial significant decrease from 295.3 +/- 22.0 to 269.7 +/- 19.9, also there if a large deduction in fasting glucose level from 208.3 +/-20.0 to 171.7 +/- 19.5. (Malhotra, Singh, Tandon, & Sharma, 2005).

There are 19 subjects between 30 to 60 years old involved in a research which is aiming to see the effect of a series of specific asanas on NIDDM (non-insulin dependent diabetes mellitus). Results shows the significance in MDA (serum malondialdehyde) which is from 6 nmol/L to 3 nmol/L, PPG (postprandial blood glucose) which is from 311mg/dl to 255mg/dl, FBG (fasting blood glucose) which is from 220mg/dl to 162mg/dl and HbA_1 which is from 8.8% to 6.4%. And subjects expressed the feelings that they feel better and stress level decreased (Singh et al., 2001).

A 8-daysshort program regarding modification of lifestyle and management of stress on 98 subjects with diabetes mellitus, hypertension, coronary artery disease and other disease has

``

shown a good results in improving LDL (low-density lipoprotein), very-LDL cholesterol, HDL (high density lipoprotein), serum total cholesterol, triglycerides and fasting plasma glucose, especially in those who has hyperglycemia or hypo cholesteremia.(Bijlani et al., 2005).

A systematic review article restricts to the original studies from 1970 to 2006 on DM 2 regarding the clinical influence and risk profiles of programs which was based on yoga. 25 papers were selected in studies including 15 uncontrolled trials, 4 randomized controlled trials, 6 non-randomized trials have shown the various benefits of yoga in DM 2 patients, such as insulin sensitivity, glucose tolerance, blood pressure, and characteristic in anthropometric, lipid profiles, coagulation profiles, pulmonary functions and other specific clinical improvements. (Innes & Vincent, 2007).

Although the few results from the recent studies which involves 363 subjects and among 5 trials is not significant, still yoga bring more improvement in DM 2 management and seems yoga has more advantages in DM 2 diabetes management within short periods. Long term as there is no conclusive or significant results in long term studies.(Aljasir, Bryson, & Al-Shehri, 2010).

As we all know that diabetes is a disorder which usually induces many co-morbidity. A 40 days intervention has done on improving specific functions of cardiovascular, glycosylated hemoglobin and blood glucose level among DM 2 patients with the help of yoga. Results indicated there is a dramatically decrease in systolic blood pressure, diastolic blood pressure and pulse rate which are from 142 +/-3.9 to 126.0 +/-3.2 mmHg and 86.7 +/- 2.5mmHg to 75.5 +/- 2.1 mmHg and from 86.45 +/- 2.0 to 77.65 +/- 2.5 beat/min respectively (Singh, Malhotra, Singh#, Madhu#, & Tandon, n.d.).

Twenty DM 2 patients without complications of proliferative retinal, cardiac and renal has been involved in a research to see the effects of asanas and pranayamas on Type 2 diabetes. Significantly positive changes happen in this research such as serum cholesterol, fasting blood glucose, postprandial blood glucose, low-density lipoprotein cholesterol and very low-density lipoprotein, as well as glaciated hemoglobin. These results indicates that the combination practice of asanas and pranayamas can bring great effect into controlling glycogenic control and lipid profile among mild to moderate DM 2 patients (Innes & Vincent, 2007).

``

In addition, 149 NIDDM (non-insulin-dependent diabetics) took part in a research which aimed at response caused yoga therapy. As per the results from OGTT (oral glucose tolerance test), out of 149 subjects, 104 subjects had a good response to yoga therapy. Dramatics decrease in AIT (area index toil) and SSI (severity scale index), furthermore, the requirements of drugs to maintain the normal glycemia also reduced (Jain, Uppal, Bhatnagar, & Talukdar, 1993)

Apart from above researches, one study on GDM (gestational diabetes mellitus) indicates that yoga exercise along with awarefull eating can help in managing GDM condition. Results shows the significant decrease in HbA1c (glycosylated hemoglobin), fasting plasma glucose and 2 hour postprandial blood glucose, $P<0.05$ (Youngwanichsetha, Phumdoung, & Ingkathawornwong, 2014).

``

3.1 Modern Literature

S.no	Title	Author & year	Sample	Type of intervention and duration	Assessment tools	Result
1.	Mindfulness-Based Stress Reduction Versus Pharmacotherapy for Chronic Primary Insomnia: A Randomized Controlled Clinical Trial.	(Cynthia R gross, march-April 2011)	27 adults	Pre-post,8 weeks duration.	The Insomnia Severity Index (ISI), Pittsburgh Sleep Quality Index (PSQI).	The efficacy of MBSR as a viable as pharmacotherapy in treatment for chronic insomnia
2.	A Pilot Study of External *Qigong* Therapy for Patients with Fibromyalgia	(Kevin W Chen,nov,2006)	10 female patients.	Pre-Post design, 3 months	PSQI Tender point count (TPC) and Fibromyalgia Impact Questionnaire (FIQ), McGill Pain Questionnaire (MPQ), Beck Depression Inventory (BDI)	Subjects demonstrated improvement in functioning, pain, and other symptoms.
3.	Mind-body interventions for the treatment of insomnia: a review.	(Elisa Korumi Kozasa,dec,2010)	12 studies from pubmed.	Mind-body interventions,Randomized and controlled trial		Cognitive behavioral therapy was the only intervention that showed better results than medication in management of insomnia
4.	Yoga of Awareness program for menopausal symptoms in breast cancer	(James W Carson,feb 2009)	37 women.	Pre-post design,3 months	Gentle yoga poses, meditation, and breathing exercises	women received the yoga program

``

	survivors: results from a randomized trial					showed significantly greater improvements relative to the control condition in hot-flash frequency
5.	Sleep Quality and Body Composition Variations in Obese Male Adults after 14 Weeks of Yoga Intervention: A Randomized Controlled Trial.	(Rshkesan PB,sep-dec,2017)	80 males.	Pre-post design,14 weeks	Pittsburgh Sleep Quality Index (PSQI)	Beneficial effects of IAYT on body composition and sleep quality in obese males
6.	Effect of yoga and aerobics exercise on sleep quality in women with Type 2 diabetes: a randomized controlled trial.	(Ebrahimi M, apr-june,2017)	39 Diabetic women.	Between Ancova design,12 weeks.	Pittsburgh Sleep Quality Index (PSQI).	yoga exercise is more effective in improving the sleep quality.
7.	Effect of Yoga on Sleep Quality and Neuro-endocrine-Immune Response in Metastatic Breast Cancer Patients.	(Roa RM,july-sept,2017)	91 subjects.	Pre-post,3months.	Insomnia Rating Scale sleep,Integrated yoga based stress reduction program,	Improvement in sleep in patients with advanced breast cancer following yoga intervention.
8.	Yoga for the management of pain and sleep in rheumatoid arthritis: a pilot randomized	(Ward L,march 2018)	26 participants.	Pre-post,9 and 12 moths.	Insomnia Severity Index (ISI), Health Assessment Questionnaire	Improvement in management of pain and

``

	controlled trial.				Disability Index (HAQ-DI)	sleep in arthritis.
9.	Efficacy of Structured Yoga Intervention for Sleep, Gastrointestinal and Behavior Problems of ASD Children: An Exploratory Study.	(J Sin diagn Res,march, 2017)	Exploratory study.	Pre-test and post-test control design.90 days	61 self-prepared Sleep questionnaire.	Significant changes in all three areas with yoga intervention.
10.	A regular yoga zntervention for staff nurse sleep quality and work stress: a randomized controlled trial.	(Fang & Li, 2015)	120 nurses.	Convenient sampling method.,6 months.	Pittsburgh Sleep Quality Index	Regular yoga practices improve sleep quality and reduce work stress in staff nurses.
11.	Stress, Inflammation, and Yoga Practice	(Kiecolt-Glaser et al., 2010)	50 healthy women.	Repeted major ANOVA	Pittsburgh Sleep Quality Index.	Regular Yoga practice can have substantial health benefits.

``

CHAPTER 4

AIMS AND OBJECTIVE

4.1AIM

To evaluate the effect of sleep special technique on sleep quality of patients suffering from chronic Auto Immune disorders (Diabetes).

4.2 OBJECTIVES

- The objective of the study is to see changes in sleep quality by using Three different questionnaire in patients suffering from chronic Auto Immune Disorder (Diabetes).
- The objective of the study is to see the effect of 1 week intervention of Sleep Special Technique by questioners (PAID- for diabetes and mood, .SSMOS- for various sleep aspects, SLOC- for behaviour changes).
- To evaluate the positive effect of SST in management of symptoms of Insomnia or sleep disturbances in Diabetic patients.

4.3 RESEARCH QUESTION

Does the practice of 1 week of Sleep Special Technique intervention have any effect on sleep quality in diabetic patients?

4.4 HYPOTHESIS

Sleep special technique may enhance the quality of sleep in Type2 Diabetes patients.

4.4 NULL HYPOTHESIS

Sleep special technique has no effect on the quality of sleep in and Diabetes patients.

``

CHAPTER 5

METHODS

5.1SUBJECTS

A total number of 82 people were screened and only 62 were recruited for the study.

5.2 Source of subjects:

Subjects for the survey were collected from the following sources:

(a) Diabetes mellitus and Insomnia patients who came to SVYASA University in Aarogyadhama.

5.3 SAMPLE SIZE

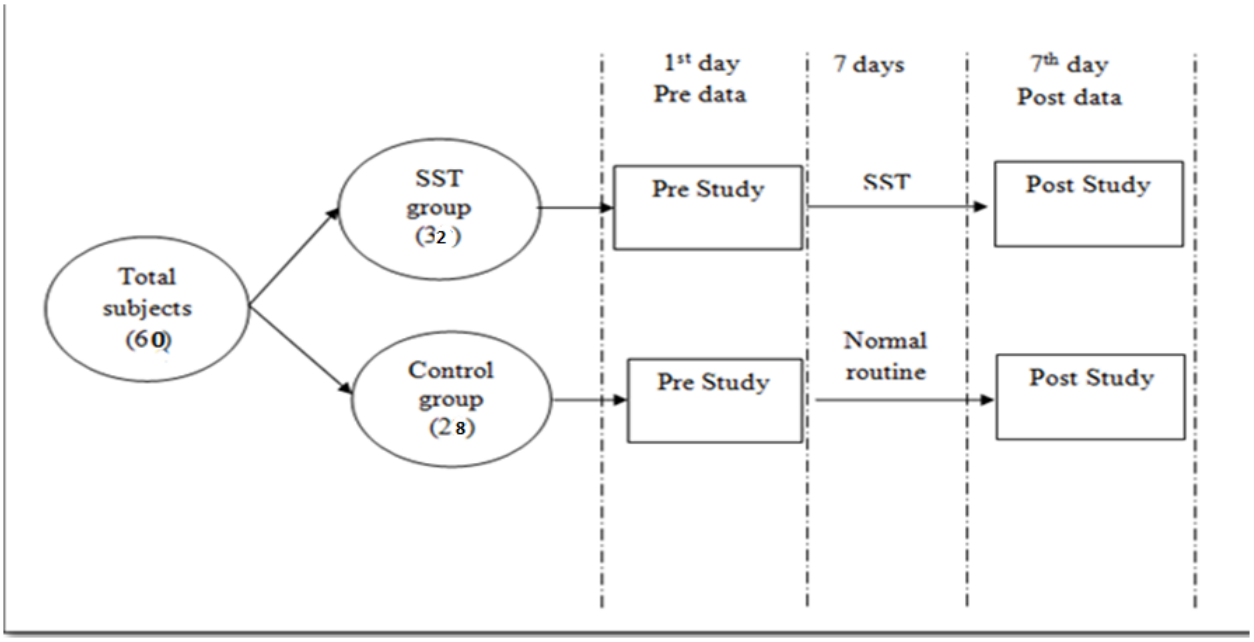
Sampling method was done by convenience to select the 62 subjects .

The sample size is calculated on the basis of previous study (kalyan Maiti, Sureshbabu V, 2018) on the beneficial effects of yoga and sleep quality. The effect size with alpha 0.05, power 0.95 with 2 groups and 2 measurements are used to estimate the sample size. The optimal simple size is estimated 30, with the assumption of dropouts (-20%) during the study. Total sample size planned is 36.

``

5.4 Design:

Between group pre-post design



5.5 Inclusion criteria:

- Adults who were older than 27 years of age up to 77 years of age both male and female and having symptoms of insomnia disorder were able to participate in the research.
- Subjects should be Diabetic patient comes in Arogyadhama.
- People having history of Diabetes mellitus at least 1 year.
- People who are willingly to participate in the 1 week SST intervention study.
- Subject who can follow the instructions and perform SST were included in the study
- Both genders.

5.6 Exclusion criteria:

- Persons having other major psychological and neurological disease.
- Alcohol addicted and Drug addicted were excluded from the study.
- Major surgery in the past. Or any surgical intervention in last 6 months

``

- Neurological or Psychiatric disorder in the past. Or any recent history under related medications were also excluded
- Severe obesity.

5.7 INFORMED CONSENT

Before starting intervention, this whole study was discussed with guide and other experts, in addition there suggestion were taken too. Also permission from Dean of Academics, Course coordinator, Arogyadhama in-charge and Section-F Doctor in charge was taken.

People were told and informed before the intervention and study, after their willingness only, were taken as subjects. Those who were not willing to be a part of study were also welcomed to come and experience about Sleep Special Technique.

5.8 Assessments- tool:

Following questionnaires were used for data collection:

(a) Problem Areas in Diabetes Questionnaire (PAID)

The Problem Area in Diabetes Questionnaire is a instrument which was perfected to value the emotional distress in people suffering from Diabetes mellitus. The scale is developed to measure the emotional problems usually faced by type 1 and type 2 diabetic patients by the help of scale which contains 20 questions. And in western countries, this scale is found valid and authentic (Snoek, Pouwer, Welch, & Polonsky, 2000) . It is found to be helpful for those who use this scale as a intervention in their studies(G. Welch, Weinger, Anderson, & Polonsky, 2003).The scale have been translated in different languages too and found valid and reliable still. It was a single domain structure constructed in the original scale with overall fundamental related with emotional distress(Polonsky et al., 1995). Now a days this scale is used worldwide in diabetes field(Venkataraman et al., 2015).

(b) Sleep Scale from Medical Outcomes Study (MOS):-

``

The Sleep Scale from Medical Outcomes Study is a questioner which contains twelve questions. In The MOS-Sleep is a 12-item measure developed using patients with chronic illness; it is divided into 6 dimensions evaluating "sleep disturbance," "snoring," "sleep awakening short of breath or with headache," "sleep adequacy," "somnolence," and "quantity of sleep/optimal sleep" (Viala-Danten, Martin, Guillemin, & Hays, 2008). It is that much reliable questioner that it is translated and used in some other languages like English, Spanish, Polish, Polish, German , Hungarian. Question number 1 is having 1 to 5 scoring and second question is about how much duration patient is having sleep at night time. The further questions are having scoring between 1-6 , in which scoring 1 is all of the time and scoring 6 is None of the time .scoring 1 is the indication of minimum and scoring 6 is the indication of maximum(M. T. Smith & Wegener, 2004).also used in patients those are suffering from fibromyalia(Cappelleri et al., 2009). So there are sufficient information about MOS questioner which proves about it's reliability.

(c) Sleep Locus of Control Scale (SLOC):-

The Sleep Locus of Control Scale is a psychometric properties which contains nine questions. It mainly focused on two main factors. One issue captured an interior sleep locus of management orientation and therefore the different mirrored an opportunity sleep locus of management orientation.

In the adult alumnae sample, having a additional probability sleep locus of management was related to larger temperament, depression, and anxiety. In adults with chronic sleep disorder, having a more internal sleep locus of control orientation was associated with increased sleep-related anxiety. One implication of the study is that too much emphasis on developing an internal sleep locus of control may be counterproductive (i.e., associated with increased sleep-related anxiety).

Instead, achieving a balance between an inside and probability sleep locus of management orientation is also a very important goal once treating people with chronic sleep disorder(Norah Vincent, Sande, Read, & Giannuzzi, 2004). Also this scale have been used in sleep in a secondary data analysis(N. Vincent, Walsh, & Lewycky, 2010).

``

(d) Visual scale:-

One more scale is taken in this study , which have been named as Visual Scale. This is to know that weather the Sleep Special Technique is giving any benefits to the patients those are taking part in this study. Basically the question asks about is there any improvement in sleep quality after the Sleep Special Technique or not. It is measured by the scoring between 1 to 6 ,In which 1 defines that Sleep Special Technique doesn't give any solution for their sleeping problem and 6 defines that the technique is actually helping them to get quality of sleep.

ETHICAL CONSIDERATIONS:-

All the study criterias were explained to participants and consent had been taken before the intervention.

``

5.9 Intervention:

Practice of 30 minutes of sleep special technique to be followed:-

SLEEP SPECIAL TECHNIQUE

Steps to be performed before going to bed **Total duration - 30 min**

1) **Standing position:**

a. Walking - 5 min

b. Centering - 2 min

2) **Sitting position**:

a. Deep abdominal breathing - 3 mins

b. NadisuddhiPranyama - 3 mins

c. Ujjayi Pranayama - 2 mins

3) **Supine position:**

Reverse DRT from head to toes - 10 min

"M" Kara - 3 rounds

"U" Kara - 3 rounds

"A" Kara - 3 rounds

"M-U-A" Kara- 3 rounds

"OM" Kara - 3 rounds

4) **"OM" japa (mental chanting) followed by silence**.

``

CHAPTER 6

DATA EXTRACTION AND ANALYSIS

(a) Problem Areas in Diabetes Questionnaire (PAID):-

Problem Areas in Diabetes Scale is a questionnaire which contains twenty questions. which measures the specific emotions which may occur because of diabetes. Emotions such as anger, guilt, fear, worry and depressed mood. In the past history of PAID questionnaire, it had been showed that it had high Internal Reliability and had very strong correlation with a standardized measurement of general psychological distress. . PAID scores were significantly related to perceived treatment adherence and blood glucose control in separate analyses controlling for age, diabetes duration, and general emotional distress. The PAID has been rescaled since its first introduction for greater ease of interpretation. It is scored 0-100, with higher scores indicating greater emotional distress(G. W. Welch, Jacobson, & Polonsky, 1997). Basically it is a scale with the scoring of 0 to 4. In which 0 tells is not a problem, 1 is minor problem, 2 is moderate problem, 3 shows somewhat serious problem, 4 is showing serious problem. The PAID is a 20-item measure of diabetes-specific emotional distress that measures a wide range of feelings related to living with diabetes and its treatment, including guilt, anger, depressed mood, worry, and fear. Earlier research showed that the PAID had high internal reliability, correlated strongly with a standardized measure of general psychological distress and weakly with age. It significantly related to perceived treatment adherence and blood glucose control in separate analyses controlling for age, diabetes duration, and general emotional distress. The PAID has been rescaled since its first introduction for greater ease of interpretation. It is scored 0-100, with higher scores indicating greater emotional distress.

As Total questions are 20, then it has to be multiply by 1.25 then it will be the sum of 100 (score of maximum). It has a strong validation that this scale is translated and used as in other languages too(Gross, Scain, Scheffel, Gross, & Hutz, 2007).

``

(b) Sleep Scale from Medical Outcomes Study (MOS):-

The MOS Sleep measure yields a sleep problems index and six scale scores: sleep disturbance (have hassle falling asleep, however long to nod off, sleep wasn't quiet, awaken during your sleep time and have hassle falling asleep again), sleep adequacy (get enough sleep to feel rested upon waking in the morning, get amount of sleep needed), daytime somnolence (drowsy during day, have trouble staying awake during the day, take naps), snoring, awaken short of breath or with headache, and quantity of sleep(Hays, Martin, Sesti, & Spritzer, 2005).Answers were supported a retrospective assessment over the past 1 week. Quantity of sleep is scored because the average hours slept per night.The other scales and issues index square measure scored on a 0–100 attainable vary, and better scores indicate a lot of of the idea being measured.

Also the scale was found reliable in the patients of those were suffering from Restless legs syndrome(Allen, Kosinski, Hill-Zabala, & Calloway, 2009). The MOS Sleep Scale was originally developed as part of the MOS, which was a 4-year observational study of health outcomes for chronically ill patients. The MOS Sleep Scale represents the portion of this larger assessment protocol that specifically focused upon sleep. The MOS Sleep Scale is a non–disease-specific measure of multiple aspects of sleep problems. Which was found as reliable assessment tool.The MOS Sleep Scale uses a spread of response sets.Item 1 tells about how long it takes to fall asleep for the patient. Response options are measured into "0–15 minutes," "16–30 minutes," "31–45 minutes," "46–60 minutes," and "more than 60 minutes." Item 2 queries about how many hours of sleep were obtained on average over the past 4 weeks. This is an open-ended question ranging between 0–24 hours. The remaining 10 items use a 6-point response set based upon the following values and anchors (1 = all of the time, 2 = most of the time, 3 = a good bit of the time, 4 = some of the time, 5 = a little of the time, and 6 = none of the time). The MOS Sleep Scale is a 12-item measure assessment tool which give information of 6 domains of sleep: 1) sleep disturbance (e.g., the ability to fall and stay asleep), 2) sleep adequacy (e.g., sleeping enough to feel rested and restored), 3) sleep quantity (e.g., the number of hours slept), 4) somnolence (e.g., daytime sleepiness), 5) snoring, and 6) shortness of breath or headache. Each scale can be hand scored. Some scales are single items and do not require scoring while others require items to be reversed and

``

summed. Each scale (except sleep quantity) is recalibrated onto a 0–100 scale.
For most scales, higher scores indicate worse sleep issues.The exceptions are sleep adequacy and sleep quantity where lower scores indicate worse sleep problems. The MOS Sleep Scale can be aggregated to produce 2 summary indices, the Sleep Problems Index II (9 items) and the Sleep Problems Index I (6 items). Each of these indices integrates the domains of sleep disturbance, sleep adequacy, shortness of breath, and somnolence into a single score. The difference between Sleep Problems Index 1 and 2 is simply length rather than domain coverage; potentially overlapping items were eliminated in Index 1. Higher scores on either index are indicative of worse sleep problems(Williams & Arnold, 2011). Basically first needs to done reverse scoring of item number 3, 5, 6, 7, 8, 9, 10, 11 .Then it is calculated between 0 to 100 score.

(c) Sleep Locus of Control Scale (SLOC):-

The Sleep locus of control Scale is having the psychometric property of eight questions .The Sleep Locus of Control (SLOC) Scale is developed to measure sleep locus of control on a continuum from chance to internal. A small number of items (n= 8) were created by the first author based on clinical experience treating those with insomnia. Responses to individual items were read on a scale from1 (strongly disagree) to 6 (strongly agree). Items 3, 4, and 6 were reversed. Items are summed to produce a total score (range of 8 to 48), with higher scores reflecting a more internal sleep locus of control(Norah Vincent et al., 2004).

This scale is also used in a research on cell phone use , which measures individuals with an external locus of control, in comparison to individuals with an internal locus
of control, have less management over their telephone use(Li, Lepp, & Barkley, 2015).
One more study was done on the relationship between sleep locus of control and sleep in a secondary data analysis, which showed significance results(N. Vincent et al., 2010). One more study shows it reliability and tells about it's development and preliminary validation of a shift-work -specific locus of control scale. It was shown that Variables associated with better coping with shift-work such as alertness, flexibility of sleeping habits and the structured use of time correlated positively with shift-work locus of control. In contrast,

``

shift-work locus of control was found to be inversely related to shift-work problems such as sleep disturbance, poor mental well-being and work stress(L. Smith, Spelten, & Norman, 1995). Sleep Locus Scale is also used in a study which was done on the patients those were having symptoms of high anxiety level, depression, and health (Sperling, Schilling, Glosser, Tracy, & Asadi-Pooya, 2008).

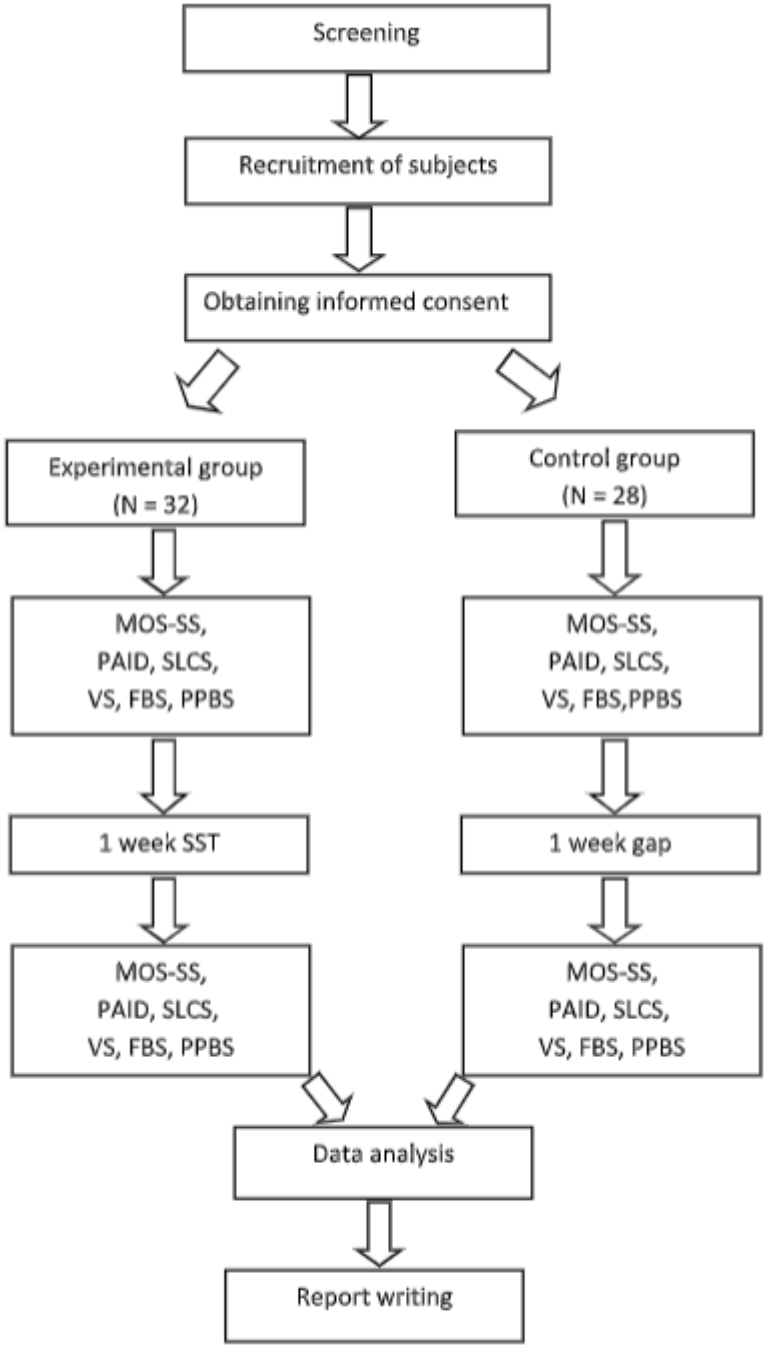
(d) Visual scale:-

Visual Scale is to measure that weather the Sleep Special Technique is giving any benefits to the patients those are taking part in this study. Basically the question asks about is there any improvement in sleep quality after the Sleep Special Technique or not. It is measured by the scoring between 1 to 6, In which 1 defines that Sleep Special Technique doesn't help in improving their sleeping problem issues and 6 defines that the technique is actually helping them to get quality of sleep.

``

CHAPTER 7

7.1) RESULTS



``

4.1 Table- 1 (Within Group& Between Groups*)*

Sl.no.	Variables	Experimental group			Control Group			Between Group
		PRE (M±SD)	POST (M±SD)	P-value	PRE (M±SD)	POST (M±SD)	P-value	P-value
1.	PAID QUESTIONNAIRE	46.21 ± 10.42	33.35 ± 10.69	0.000**	42.45 ± 10.85	46.29 ± 6.70	0.0019*	0.000**
2.	SLEEP LOCUS PART-1	20.56 ± 6.87	26.21 ± 4.14	0.000**	20.03 ± 3.27	20.89 ± 3.64	0.1787	0.000**
3.	SLEEP LOCUS PART-2	10.06 ± 2.61	12.62 ± 2.44	0.000**	11.60± 2.48	11.42 ± 2.20	0.6465	0.0524
4.	VISUAL SCALE	1.21 ± 0.42	4.85 ± 1.09	0.000**	1.07 ± 0.37	1.45 ± 0.99	0.0519	0.000**
5.	Sleep Disturbance (SLPD4)	56.95 ±	32.62 ±	0.000**	51.29± 11.98	46.25 ±	0.0199*	0.0000*

``

		14.82	12.26			10.25		
6.	SNORING (SLPSNR1)	48.12 ± 2 9.12	48.12 ± 2 4.28	1	38.57± 24.29	41.42 ± 24.90	0.1024	0.2967
7.	Sleep Short of Breath or Headache (SLPSOB1)	50 ± 23.82	56.87 ± 22.78	0.0389*	45 ± 24.72	43.57 ± 24.97	0.71	0.0351*
8.	Sleep Adequacy (SLPA2)	49.37 ± 17.40	61.56 ± 17.05	0.000***	48.57± 14.83	46.42 ± 18.30	0.3860	0.0015*
9.	Sleep Somnolence (SLPS3)	55 ± 14.76	44.79 ± 17.28	0.000**	52.61 ± 13.12	46.90 ± 13.01	0.0001*	0.59910
10.	Sleep Problems Index 1 (SLP6)	46.97 ± 11.94	50.4 ± 11.33	0.000**	50 ± 8.4	54.14 ± 9.03	0.1797	0.009*
11.	Sleep Problems Index 2	45.03 ±	47.68 ±	0.0788	48.77 ±	51.03 ±	0.0412*	0.0110*

``

	(SLP9)	10.7	9.35		6.71	7.11		
12.	FBS	171.76 ± 76.23	135.16 ± 69.54	0.0127*	138.64 ± 64.34	105.25± 86.64	0.0640	0.2108
13.	PPBS	246.36 ± 119.39	183.30 ± 93.91	0.0207*	223.12 ± 117.71	149.51± 123.61	0.1075	0.5634

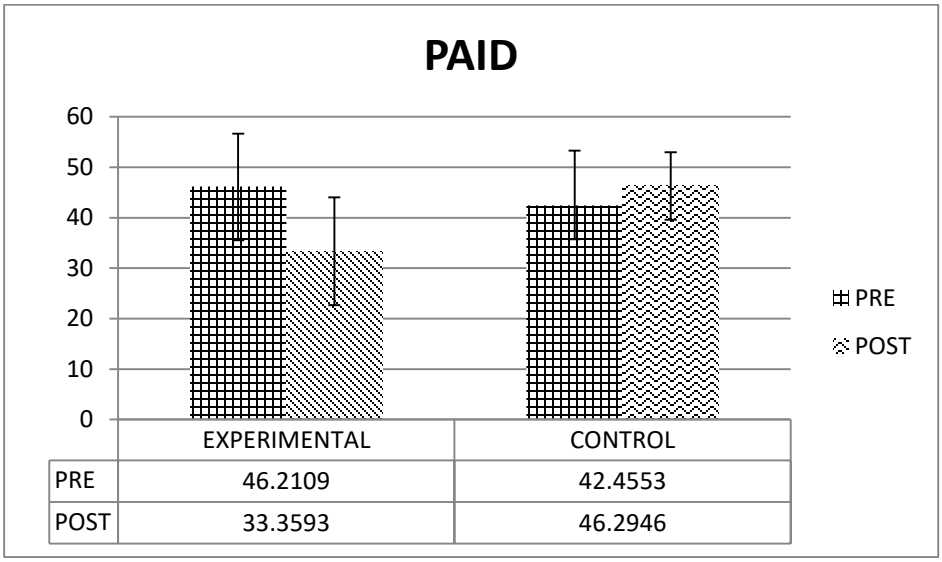
* Significant

** Highly Significant

``

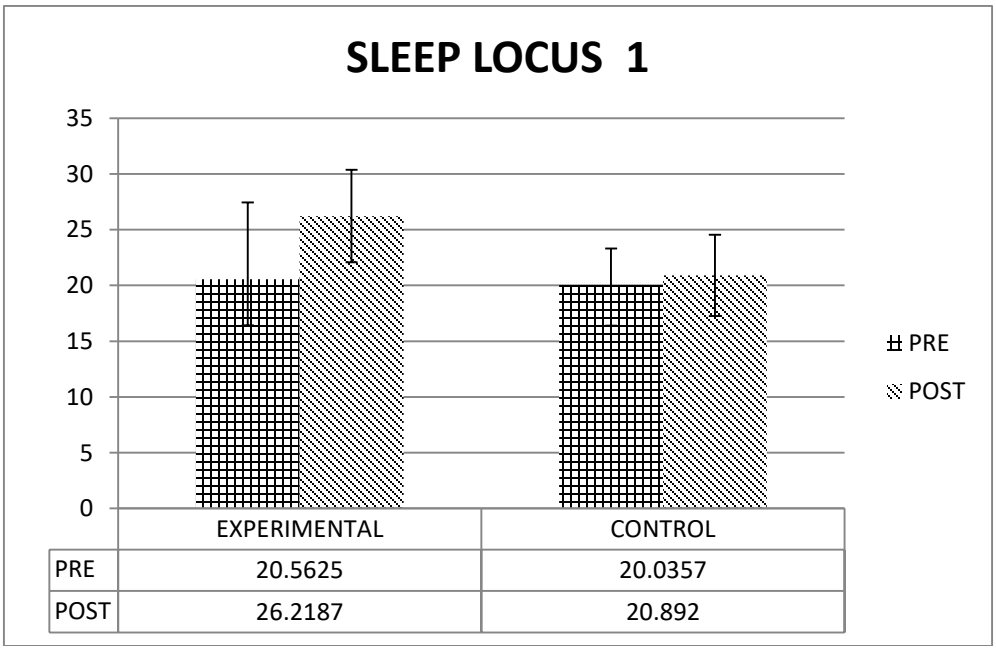
Graphs of results

Graph 1: Comparison of PAID Score in Experimental and Control group



	EXPERIMENTAL	CONTROL
PRE	46.2109	42.4553
POST	33.3593	46.2946

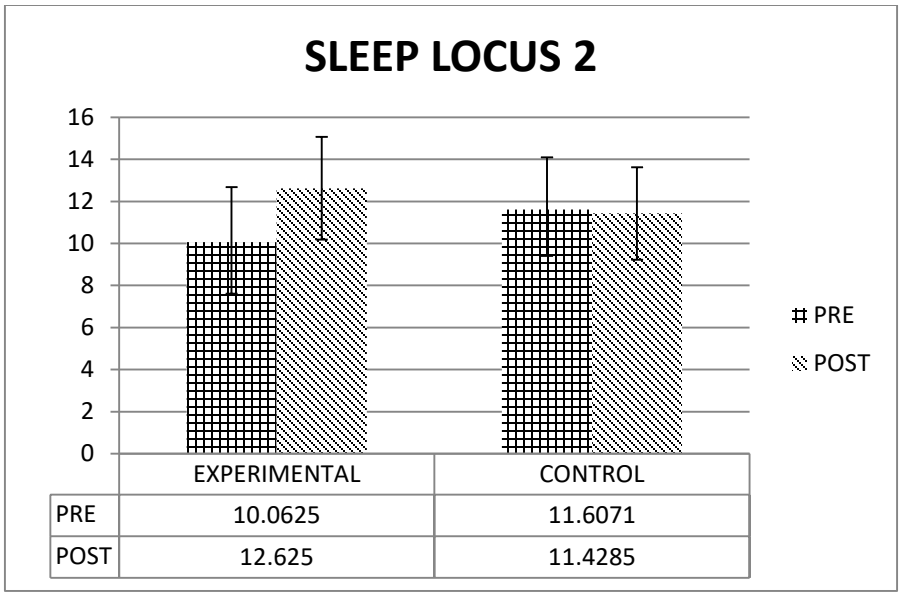
Graph 2: Comparison of SLOC-1 Score in Experimental and Control group



	EXPERIMENTAL	CONTROL
PRE	20.5625	20.0357
POST	26.2187	20.892

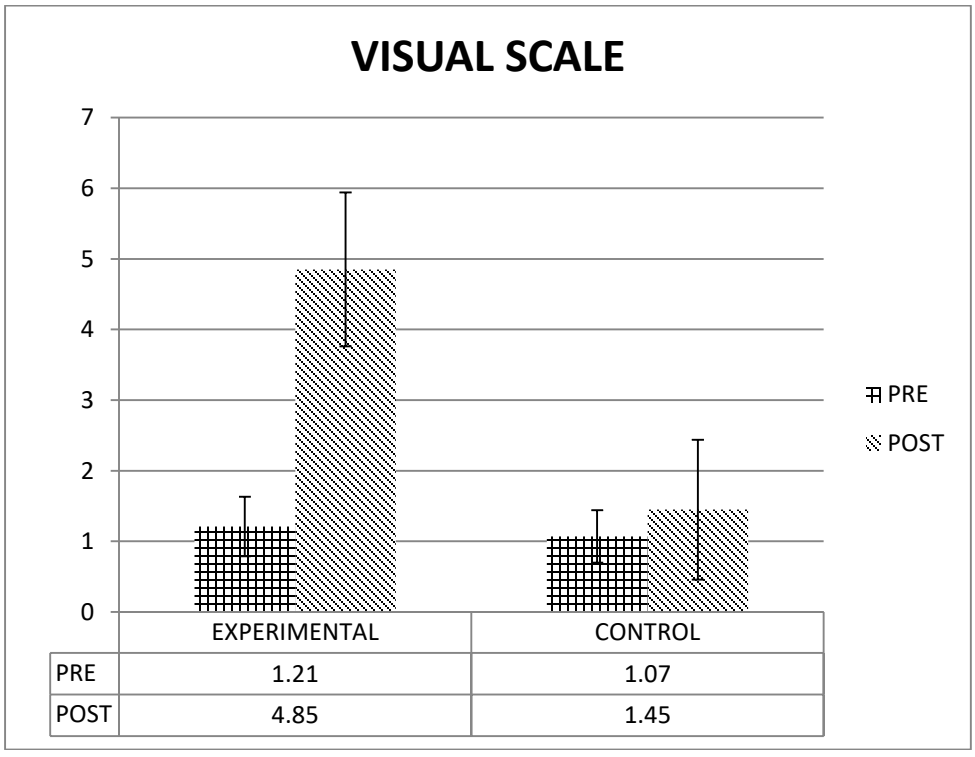
``

Graph 3: Comparison of SLOC-2 Score in Experimental and Control group



	EXPERIMENTAL	CONTROL
PRE	10.0625	11.6071
POST	12.625	11.4285

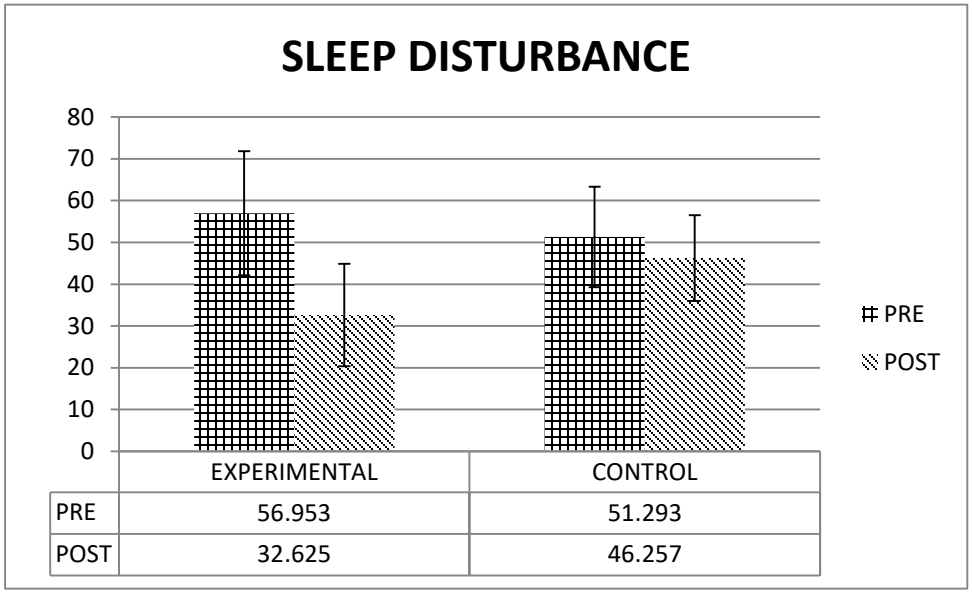
Graph4: Comparison of Visual Scale Score in Experimental and Control group



	EXPERIMENTAL	CONTROL
PRE	1.21	1.07
POST	4.85	1.45

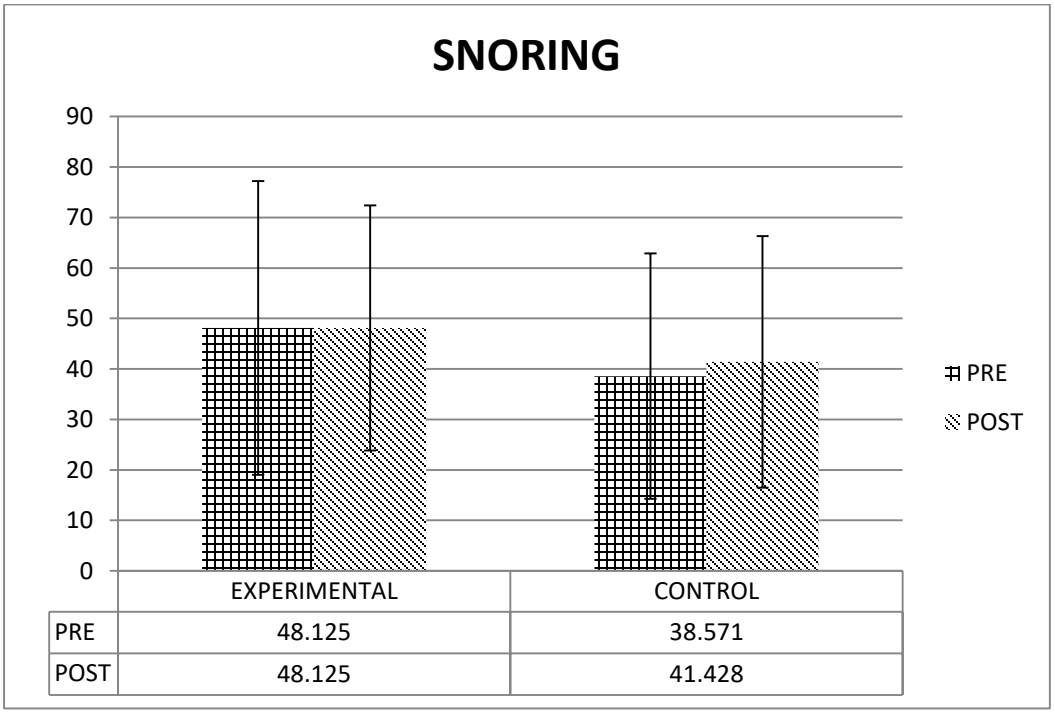
``

Graph5: Comparison of Sleep Disturbance Score in Experimental and Control group



	EXPERIMENTAL	CONTROL
PRE	56.953	51.293
POST	32.625	46.257

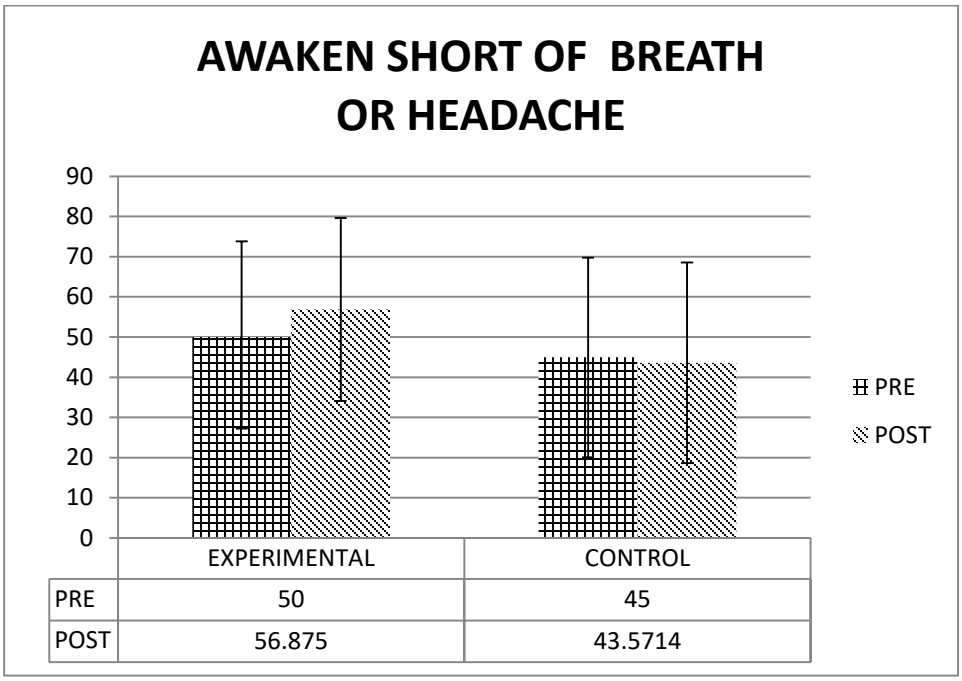
Graph6: Comparison of Snoring Score in Experimental and Control group



	EXPERIMENTAL	CONTROL
PRE	48.125	38.571
POST	48.125	41.428

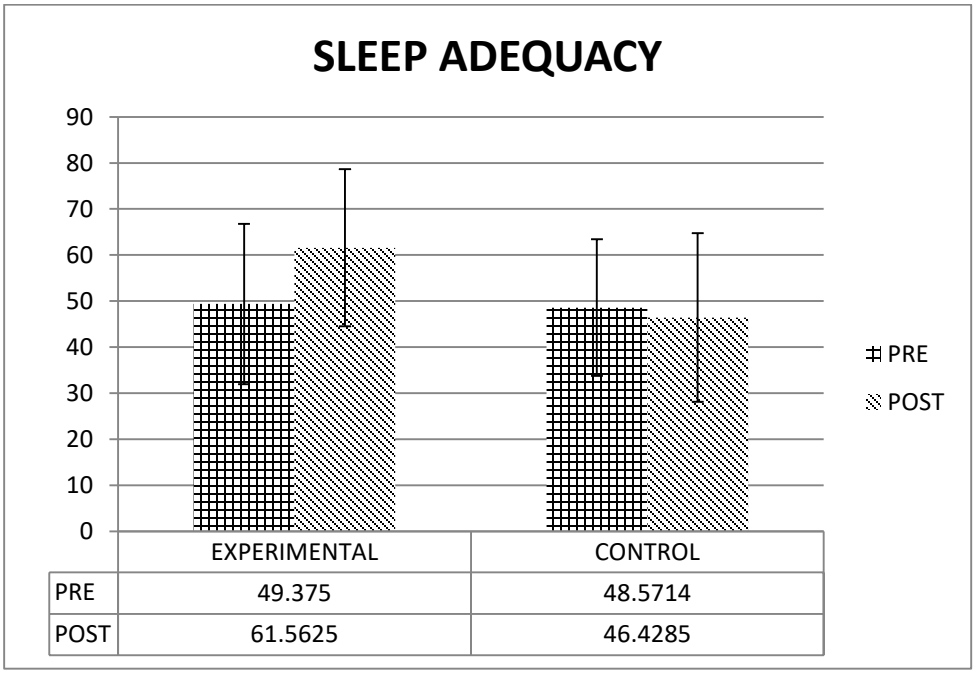
``

Graph7: Comparison of Awaken Short of Breath or Headache Score in Experimental and Control group



	EXPERIMENTAL	CONTROL
PRE	50	45
POST	56.875	43.5714

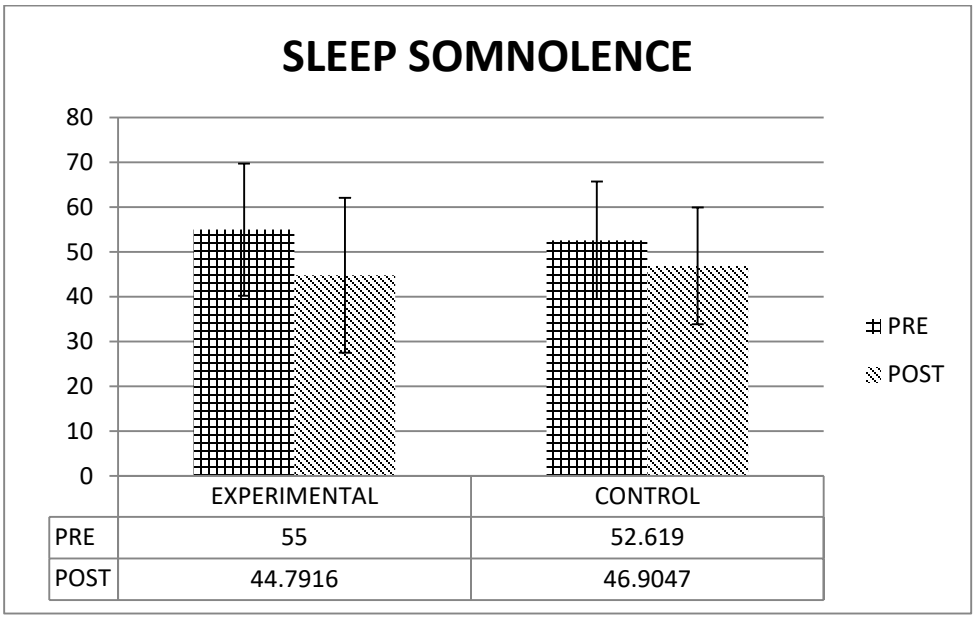
Graph8: Comparison of Sleep Adequacy Score in Experimental and Control group



	EXPERIMENTAL	CONTROL
PRE	49.375	48.5714
POST	61.5625	46.4285

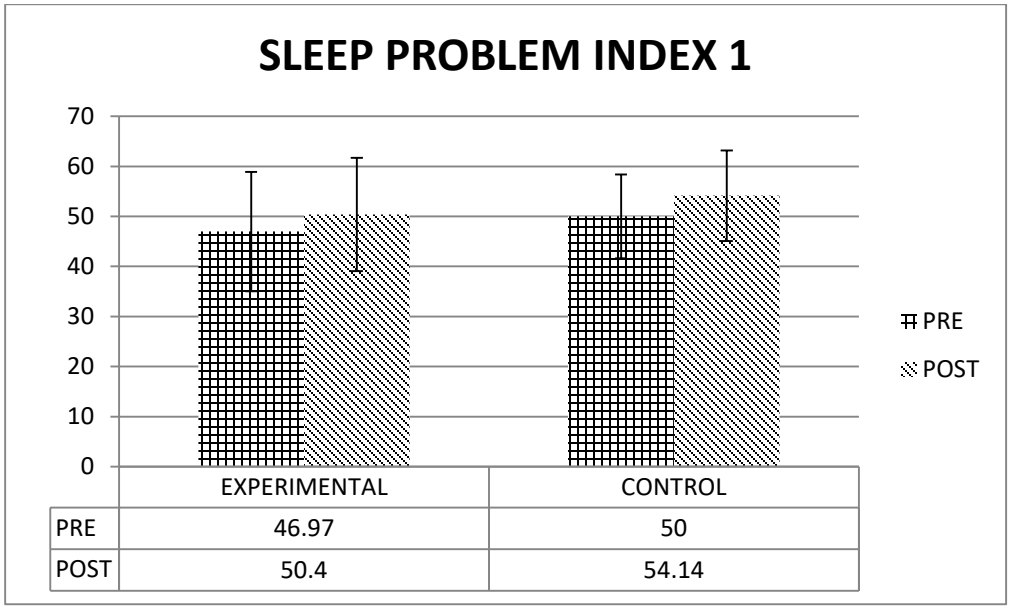
``

Graph9: Comparison of Sleep Somnolence Score in Experimental and Control group



	EXPERIMENTAL	CONTROL
PRE	55	52.619
POST	44.7916	46.9047

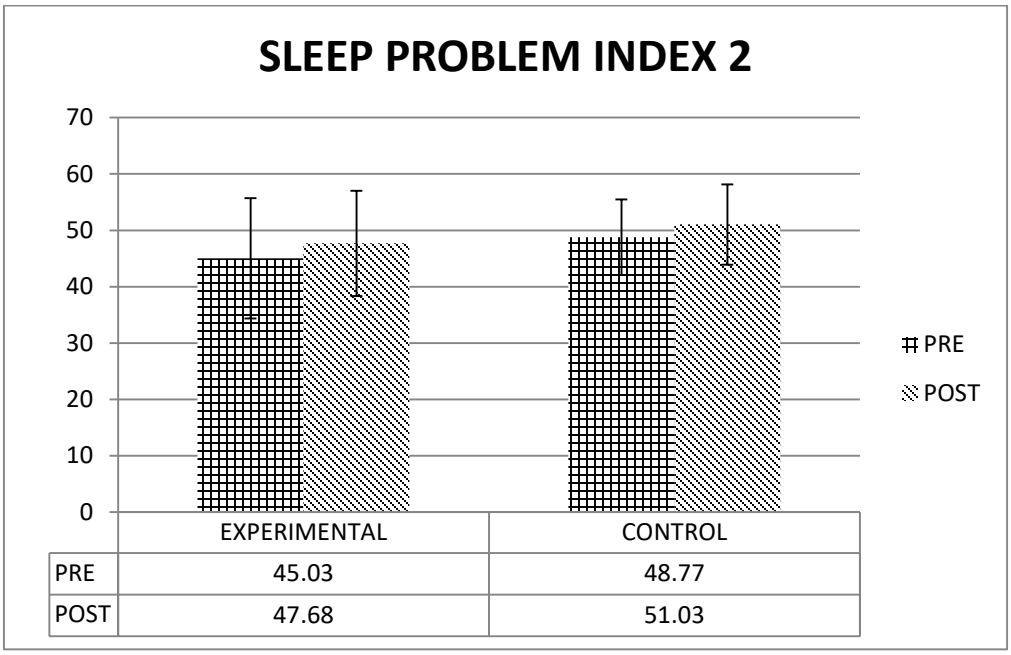
Graph10: Comparison of Sleep Problem Index-1 Score in Experimental and Control group



	EXPERIMENTAL	CONTROL
PRE	46.97	50
POST	50.4	54.14

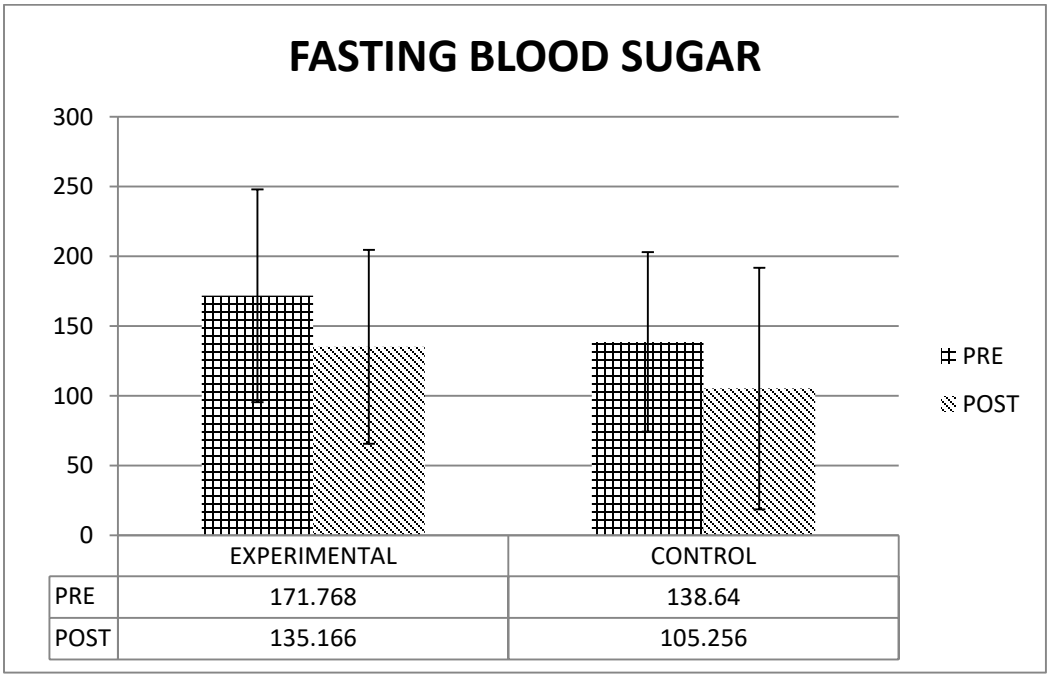
``

Graph11: Comparison of Sleep Problem Index-2 Score in Experimental and Control group



	EXPERIMENTAL	CONTROL
PRE	45.03	48.77
POST	47.68	51.03

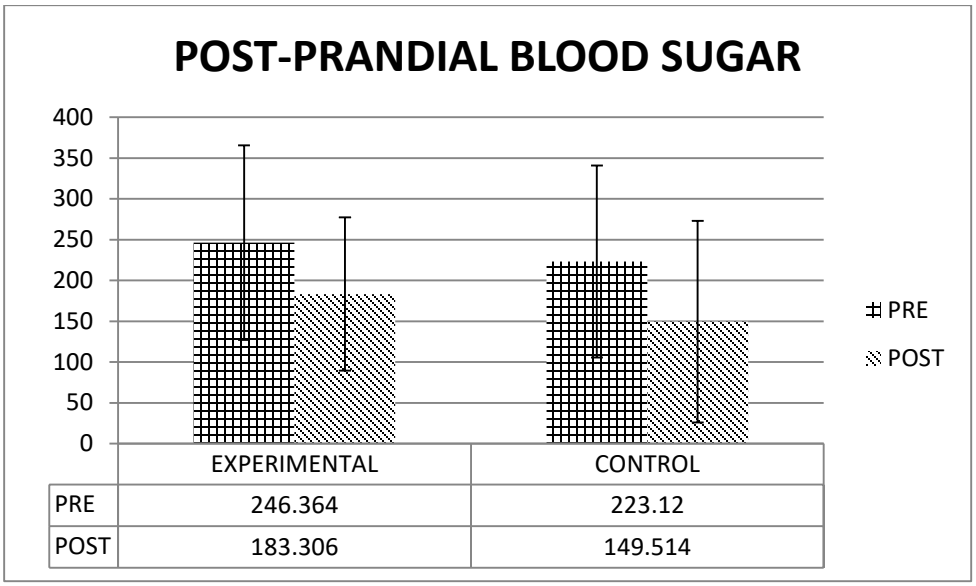
Graph12: Comparison of FBS Glucose Score in Experimental and Control group



	EXPERIMENTAL	CONTROL
PRE	171.768	138.64
POST	135.166	105.256

``

Graph13: Comparison of PPBS Glucose Score in Experimental and Control group



	EXPERIMENTAL	CONTROL
PRE	246.364	223.12
POST	183.306	149.514

``

CHAPTER 8

DISCUSSION

PAID QUESTIONNAIRE:-

In the current study we have found highly significant change in the experiment group as compared to the control group ($p<0.001^{**}$). The result of a study by K. Annika regards with depression and behaviour check in diabetic patients shows the improvement in changing psychological symptoms which also supports the current study in which there are significant improvement have been found (Tovote et al., 2014). Another study on the improvement in psychological symptoms in diabetic patients supports too the current study by showing the significant changes (Aziz et al., 2018).

SS-MOS QUESTIONNAIRE :-

In the current study we have found that SS-MOS scale is very effective in measuring various aspects of sleep such as sleep disturbance, sleep adequacy, Sleep problem index-1,shows highly significant improvement($p<0.001^{**}$) and awaken short of breath or headache sleep problem index-2 shows significant improvement ($p<0.05^{*}$), better changes in experimental group compare to control group. whereas within group analysis shows highly significant change in sleep somnolence in both groups and in snoring, there is no change. A study by R. Anderson and his team indicates that by the help of meditation and yogic activities, there subjects were observed less sleep problems issues in the end of study. Which totally supports the current study result (Andersen et al., 2013). Another study on women having breast cancer supports the current study in which simple yoga practices were given to improve quality of life, and the study results were significant enough to support (Chandwani et al., 2014).

``

SLOC QUESTIONNAIRE:-

In the current study we found that SLOC assessment tool is an effective tool to measure the problems regarding insomnia or sleep problem. Results indicate that there is highly significant change in sleep locus-1($p<0.001$**) in experimental group as compare to control group. whereas highly significant changes in with-in group of sleep locus-2($p<0.001$),experimental group compare to control group. A recent study done in the end of 2015 by Jian Li on Locus of control and cell phone use: Implications for sleep quality, academic performance, and subjective well-being found that this scale have reliability to check and know about sleep related locus of control, external as well as internal of an individuals. The result of the study supports the current study which indicates significant improvements (Li et al., 2015). Another study on spiritual well-being counselor adaptability also supports the current study by showing well-being in nature, which indicates highly changes in internal locus of control (Tse, 2001).

VISUAL SCALE:-

It is a scale which was added in the current study to know about the feedback of diabetes participants, coming for treatment in arogyadhama. It is found very helpful in this study to measure participant's view of prospective and showed highly significant improvement ($p<0.001$**) in experimental group as compare to control group. The scale was added after discussion and concern with respected professors and seniors in the path of Researches.

``

CHAPTER 9

CONCLUSION

Practice of Sleep Special Technique improves Subjective Sleep Quality, Overall Quality of Life and brings positivity in individual. Harmony towards life-style and behavior was evident higher through Sleep Special Technique Practice.

``

CHAPTER 10

APPRAISAL

10.1 Strength of the study

- This is one of a kind study to understand the effect of Sleep Special Technique on sleep quality in Diabetic patients.
- Both Experimental (SST) and Control group subjects were from Arogyadhama Residential treatment.

10.2 Limitation of the study

- Study is bound only with Diabetic population.

10.3 Suggestion for further study

- The SST can be given as intervention for other stress and depression related issues.
- Same study should be replicated with other population such as other sleep disorder problems, Hypertension, Back pain etc.
- Companion of joint SST, SST+IAYT and joint IAYT can add more values.

``

APPENDIX-1

Problem Areas in Diabetes Questionnaire (PAID)

DAWN
Diabetes Attitudes Wishes & Needs

INSTRUCTIONS: Which of the following diabetes issues are currently a problem for you?
Circle the number that gives the best answer for you. Please provide an answer for each question. Please bring the completed form with you to your next consultation where it will form the basis for a dialogue about how you are coping with your diabetes.

Patient name: Completion date: Interview date:

	Not a problem	Minor problem	Moderate problem	Somewhat serious problem	Serious problem
1. Not having clear and concrete goals for your diabetes care?	0	1	2	3	4
2. Feeling discouraged with your diabetes treatment plan?	0	1	2	3	4
3. Feeling scared when you think about living with diabetes?	0	1	2	3	4
4. Uncomfortable social situations related to your diabetes care (e.g., people telling you what to eat)?	0	1	2	3	4
5. Feelings of deprivation regarding food and meals?	0	1	2	3	4
6. Feeling depressed when you think about living with diabetes?	0	1	2	3	4
7. Not knowing if your mood or feelings are related to your diabetes?	0	1	2	3	4
8. Feeling overwhelmed by your diabetes?	0	1	2	3	4
9. Worrying about low blood sugar reactions?	0	1	2	3	4
10. Feeling angry when you think about living with diabetes?	0	1	2	3	4
11. Feeling constantly concerned about food and eating?	0	1	2	3	4
12. Worrying about the future and the possibility of serious complications?	0	1	2	3	4
13. Feelings of guilt or anxiety when you get off track with your diabetes management?	0	1	2	3	4
14. Not "accepting" your diabetes?	0	1	2	3	4
15. Feeling unsatisfied with your diabetes physician?	0	1	2	3	4
16. Feeling that diabetes is taking up too much of your mental and physical energy every day?	0	1	2	3	4
17. Feeling alone with your diabetes?	0	1	2	3	4
18. Feeling that your friends and family are not supportive of your diabetes management efforts?	0	1	2	3	4
19. Coping with complications of diabetes?	0	1	2	3	4
20. Feeling "burned out" by the constant effort needed to manage diabetes?	0	1	2	3	4

changing how we care for diabetes

www.dawnstudy.com

novo nordisk®

``

APPENDIX-2

Sleep Scale from the Medical Outcomes Study

1. How long did it usually take for you to fall asleep during the past 4 weeks?

(Circle One)

0-15 minutes……..…1

16-30 minutes……..2

31-45 minutes……..3

46-60 minutes……..4

More than 60 minutes …….5

---

2. On the average, how many hours did you sleep each night during the past 4 weeks?

Write in number

of hours per night: ☐☐

``

How often during the past 4 weeks did you…

(Circle One Number On Each Line)

	All of the Time ▼	Most of the Time ▼	A Good Bit of the Time ▼	Some of the Time ▼	A Little of the Time ▼	None of the Time ▼
3. feel that your sleep was not quiet (moving restlessly, feeling tense, speaking, etc., while sleeping)?	1	2	3	4	5	6
4. get enough sleep to feel rested upon waking in the morning?	1	2	3	4	5	6
5. awaken short of breath or with a headache?	1	2	3	4	5	6
6. feel drowsy or sleepy during the day?	1	2	3	4	5	6
7. have trouble falling asleep?	1	2	3	4	5	6
8. awaken during your sleep time and have trouble falling asleep again?	1	2	3	4	5	6
9. have trouble staying awake during the day?	1	2	3	4	5	6
10. snore during your sleep?	1	2	3	4	5	6
11. take naps (5 minutes or longer) during the day?	1	2	3	4	5	6
12. get the amount of sleep you needed?	1	2	3	4	5	6

Hays, R. D., & Stewart, A. L. (1992). Sleep measures. In A. L. Stewart & J. E. Ware (eds.), Measuring functioning and well-being: The Medical Outcomes Study approach (pp. 235-259). Durham, NC: Duke University Press.

``

APPENDIX-3

Sleep Locus of Control Scale

1. If I take care of myself, I can avoid insomnia

1	2	3	4	5	6
Strongly disagree					**Strongly agree**

2. Whether I have insomnia is entirely up to me

1	2	3	4	5	6
Strongly disagree					**Strongly agree**

3. Good sleep is largely a matter of luck

1	2	3	4	5	6
Strongly disagree					**Strongly agree**

4. No matter what I do, if I am going to have a sleepless night, I will

1	2	3	4	5	6
Strongly disagree					**Strongly agree**

5. When I have insomnia, I know it is because of something I have done (e.g., not enough time to relax, worrying about things that I can't control, worrying about not sleeping)

1	2	3	4	5	6
Strongly disagree					**Strongly agree**

6. People who never get insomnia are just plain lucky

1	2	3	4	5	6
Strongly disagree					**Strongly agree**

7. People's insomnia results from their own carelessness

1	2	3	4	5	6
Strongly disagree					**Strongly agree**

8. I am directly responsible for my sleep

1	2	3	4	5	6
Strongly disagree					**Strongly agree**

``

INFORMED CONSENT FORM

Title of the study: Effect of sleep special technique on Chronic Auto-Immune Disorder (Diabetes): A randomized control study.

Investigator: Jagjeet Singh, M.Sc. (YT)

Name of the guide: Dr. V. Sureshbabu

Name of the Participant: …….

Date and Time: ……and ……

About the Project

In order to assess the effect of Quality of sleep, Behavior, Quality of life, before and after the practice of Sleep Special Technique for a period of one week. They will be administrated Problem Area in Diabetes(PAID), Sleep Scale of Medical Outcomes, Sleep Locus of Control and the Visual Scale, before and after one week of Sleep Special Technique.

Undertaking by the investigator

Your consent to participate in the about the study is sought. You have a right to refuse consent or withdraw the same during any part of the study without giving any reason. I undertake to maintain complete confidentiality of the information obtained from you during the course of the study. Please clarify any doubt about the study. Even during the study, you are free to contact the investigator for clarification if you so desire.

Consent

I have been informed about the procedures of the study. The possible risks too have been explained to me as started in the information. I have understood that I have the right to refuse my consent or withdraw it any time during the study without adversely affecting my health. I am aware that by subjecting to this intervention, I will have to give more time to assessments by the investigating team and that these assessments do not interfere with my health.
I, ……....., the undersigned, give my consent to be a participant of this investigation/study program.

Signature of the Participant
(Name)

Date:

Signature of the investigator

(Name and Designation)

Place:

``

RAW DATA

SL.NO	Group	GENDER	PRE_FBS	POST_FBS	PRE_PPBS	POST_PPBS
1	EX	F	#NULL!	#NULL!	#NULL!	#NULL!
3	EX	M	#NULL!	#NULL!	#NULL!	#NULL!
4	CON	F	151	145.00%	367	332
5	CON	F	#NULL!	#NULL!	#NULL!	#NULL!
6	CON	M	#NULL!	#NULL!	#NULL!	#NULL!
7	EX	F	#NULL!	#NULL!	#NULL!	#NULL!
8	EX	M	145	122	216	150
9	EX	M	271	166	338	232
10	EX	M	200	175	383	281
11	EX	M	188	174	306	232
12	EX	F	#NULL!	#NULL!	#NULL!	#NULL!
13	EX	M	210	138	429	215
14	EX	M	123	103.00%	201	140.00%
15	EX	F	#NULL!	#NULL!	#NULL!	#NULL!
16	EX	M	165	96	254	150
17	EX	F	106	100	192	176
18	EX	F	147	140	201	197
19	EX	F	234	104	252	157
20	EX	F	201	208	346	183
21	EX	M	#NULL!	#NULL!	#NULL!	#NULL!
22	EX	M	151	142	278	189
23	EX	M	259	189	310.00%	255
24	EX	F	305	271	433	368
25	EX	F	199	171	285	177
26	EX	M	98	96	163	120
27	EX	F	221	139	286	175
28	EX	M	148	121	221	141
29	EX	M	110.00%	90	190.00%	146
30	EX	M	210.00%	164	310.00%	243
31	EX	F	107	102.00%	125	125.00%
32	EX	M	198	230	269	305
33	EX	M	170	99	302	138
34	EX	M	298	241	361	348
35	EX	M	147	110.00%	310	200.00%
36	EX	M	#NULL!	#NULL!	#NULL!	#NULL!
38	CON	M	#NULL!	#NULL!	#NULL!	#NULL!
39	CON	M	125.00%	125.00%	134	103

``

40	CON	M	136	188	195	324
41	CON	F	#NULL!	139	#NULL!	154
42	CON	M	106	90.00%	130	110.00%
43	CON	F	133	133	187	107
44	CON	F	126	120	183	149
45	CON	F	148	153	246	248
46	CON	F	#NULL!	226	#NULL!	396
47	CON	F	174	128	235	#NULL!
48	CON	F	160	130.00%	247	180.00%
49	CON	M	#NULL!	#NULL!	#NULL!	#NULL!
50	CON	M	158	120.00%	258	200.00%
51	CON	F	138	82	356	248
52	CON	M	122	95	288	198.00%
53	CON	F	#NULL!	#NULL!	#NULL!	#NULL!
54	CON	M	169	169	280.00%	244
55	CON	F	240	178.00%	412	335.00%
56	CON	F	#NULL!	#NULL!	#NULL!	#NULL!
57	CON	F	164.00%	138	212.00%	183
58	CON	F	255	300	319	302
59	CON	F	#NULL!	#NULL!	#NULL!	#NULL!
60	CON	M	138	121	243	142

SL.NO	PAID_SCORE_PRE	PAID_SCORE_POST	SLS_SCORE_PRE1	SLS_SCORE_PRE2	SLS_SCORE_POST1	SLS_SCORE_POST2
1	61	43	27	16	35	13
3	50	39	29	14	33	12
4	65	64	22	13	21	14
5	71	49	21	14	22	13
6	71	53	21	18	34	12
7	24	14	19	10	23	9
8	43	25	23	11	30	14
9	50	28	17	12	25	16
10	38	28	27	16	32	18

``

11	38	24	16	9	24	11
12	44	28	18	9	23	12
13	45	33	13	10	23	14
14	51	33	21	9	27	13
15	45	34	23	13	30	17
16	48	34	13	9	22	13
17	49	26	16	9	23	14
18	41	24	19	9	29	11
19	41	29	17	7	28	12
20	39	24	22	9	33	13
21	39	25	51	9	29	15
22	53	35	12	10	19	12
23	51	35	18	8	28	11
24	45	36	22	9	31	12
25	43	25	17	10	22	15
26	48	35	20	9	31	13
27	49	33	19	12	25	15
28	53	33	18	6	27	9
29	68	54	21	3	21	5
30	15	13	21	10	23	10
31	38	55	27	14	20	12
32	56	41	18	11	25	13
33	63	45	17	10	23	12
34	53	36	18	9	24	12

``

35	44	59	18	10	25	13
36	60	48	21	10	26	13
38	43	46	14	9	18	8
39	30	38	19	13	17	12
40	39	48	19	10	18	9
41	34	40	25	13	22	11
42	45	53	19	11	18	14
43	44	45	14	14	16	12
44	39	45	28	12	23	11
45	45	48	16	9	18	9
46	39	40	22	12	24	12
47	31	39	19	8	18	8
48	38	43	24	9	25	11
49	35	41	20	13	20	12
50	48	45	19	8	20	9
51	38	40	21	12	21	12
52	38	49	20	12	21	9
53	36	44	16	13	19	11
54	49	51	18	9	20	11
55	48	59	23	14	24	15
56	40	46	18	10	18	12
57	39	50	22	11	25	9
58	39	46	15	15	20	17
59	34	50	23	13	23	11

``

60	36	45	22	7	18	10

SL.NO	**SSMOS_PRE_1**	**SSMOS_PRE_2**	**SSMOS_PRE_3**	**SSMOS_PRE_4**	**SSMOS_PRE_5**	**SSMOS_PRE_6**
1	50	4	20	80	20	60
3	25	6	80	20	100	80
4	0	3	40	40	80	20
5	100	3	40	80	20	40
6	75	4	40	40	40	60
7	75	4	20	60	60	40
8	100	4	80	80	100	80
9	50	4	40	20	60	40
10	25	5	20	40	80	40
11	50	5	40	80	60	20
12	100	4	20	60	20	40
13	25	5	20	100	60	40
14	100	4	40	40	60	20
15	50	4	40	40	20	40
16	50	3	20	20	60	20
17	50	5	80	60	80	20
18	25	4	60	60	40	60
19	50	3	60	60	40	0
20	50	4	20	40	0	20
21	75	3	40	80	60	40
22	50	4	0	20	40	60

``

23	100	3	40	60	40	20
24	0	5	20	80	40	0
25	50	4	40	20	20	40
26	25	4	40	60	40	20
27	50	4	20	80	40	40
28	50	4	40	80	60	40
29	100	3	40	60	40	20
30	25	6	0	60	100	60
31	0	6	80	20	80	40
32	0	5	40	40	20	40
33	50	3	40	60	60	40
34	75	3	20	60	40	60
35	0	5	20	60	40	60
36	75	3	60	40	60	40
38	50	5	20	60	40	40
39	25	4	40	60	20	80
40	25	6	20	60	40	60
41	50	6	60	80	40	60
42	25	5	80	40	80	40
43	25	6	20	60	40	80
44	50	4	40	60	80	20
45	25	5	40	60	20	80
46	50	4	80	40	20	40
47	50	5	40	20	60	40

``

48	25	5	100	40	60	20
49	25	5	60	20	60	0
50	50	4	40	20	80	80
51	50	4	40	40	60	20
52	25	3	40	60	60	20
53	25	5	40	60	60	20
54	75	3	20	20	60	20
55	50	4	40	60	80	100
56	25	5	40	60	60	100
57	25	5	40	60	0	40
58	75	4	40	80	60	80
59	25	4	40	40	100	100
60	50	3	60	60	80	80

SL.NO	**SSMOS_PRE_7**	**SSMOS_PRE_8**	**SSMOS_PRE_9**	**SSMOS_PRE_10**	**SSMOS_PRE_11**	**SSMOS_PRE_12**
1	20	40	60	80	40	80
3	100	60	100	100	100	20
4	80	80	20	0	0	40
5	20	60	60	40	20	80
6	40	40	60	80	20	80
7	40	40	40	60	0	80
8	20	80	40	80	40	80
9	20	100	40	40	80	60
10	20	40	40	60	40	20

``

11	40	60	40	20	20	80
12	40	60	40	60	80	60
13	0	40	40	80	40	20
14	0	20	40	40	60	20
15	0	20	40	100	60	60
16	0	20	80	20	60	40
17	40	60	40	100	40	40
18	20	20	40	40	80	60
19	40	20	80	20	100	60
20	40	0	20	80	0	0
21	0	20	40	40	80	80
22	0	40	20	60	60	40
23	60	60	20	0	60	20
24	20	60	40	40	100	20
25	40	100	80	80	60	60
26	40	20	20	60	40	40
27	60	20	40	80	60	40
28	20	40	60	20	40	80
29	60	100	0	20	60	60
30	60	100	100	40	100	20
31	40	80	20	100	60	20
32	60	60	20	40	60	40
33	20	60	60	40	60	40
34	60	60	40	60	80	60

``

35	40	20	40	60	60	40
36	60	100	60	60	40	40
38	20	60	40	20	20	60
39	40	60	40	40	40	60
40	40	80	40	80	40	80
41	40	20	60	40	60	60
42	40	60	40	80	20	40
43	40	20	60	20	60	40
44	80	40	20	80	60	60
45	40	20	60	100	60	40
46	40	40	80	40	40	40
47	60	80	60	40	0	60
48	80	0	40	40	40	80
49	80	40	60	0	60	60
50	40	0	60	80	0	40
51	60	40	60	40	60	40
52	80	80	60	80	0	60
53	0	40	60	80	60	60
54	80	80	40	60	40	20
55	100	80	40	40	40	40
56	0	20	60	80	20	20
57	20	100	40	60	40	60
58	0	80	40	80	40	60
59	20	60	60	80	40	60

``

60	80	60	0	60	80	40

SL.NO	**SSMOS_POST_1**	**SSMOS_POST_2**	**SSMOS_POST_3**	**SSMOS_POST_4**	**SSMOS_POST_5**	**SSMOS_POST_6**
1	20	5	60	60	40	80
3	0	5	80	20	100	60
4	0	4	60	40	40	60
5	80	3	40	80	20	60
6	60	4	40	60	40	60
7	0	6	60	60	80	60
8	20	6	80	80	100	100
9	0	6	60	0	40	60
10	0	6	40	20	60	60
11	0	6	60	60	40	40
12	20	6	40	40	0	60
13	0	6	40	80	40	80
14	0	6	60	20	40	60
15	0	5	60	20	20	60
16	0	4	40	0	40	40
17	20	5	80	40	60	60
18	0	5	100	40	40	80
19	0	5	40	40	20	60
20	0	6	60	0	40	60
21	20	5	80	40	40	80
22	20	6	40	40	40	100

``

23	20	5	80	20	40	40
24	0	6	60	60	20	40
25	0	5	80	0	20	80
26	0	5	80	40	40	40
27	0	6	60	60	20	60
28	100	5	60	20	60	60
29	20	6	60	40	20	40
30	0	6	40	40	80	80
31	0	6	80	20	100	20
32	40	3	20	60	40	20
33	20	5	60	60	80	60
34	20	5	40	20	60	80
35	40	4	60	40	20	80
36	20	5	40	20	40	20
38	60	4	40	60	40	80
39	20	4	40	60	20	80
40	20	6	40	60	20	60
41	40	6	60	60	20	40
42	20	5	60	40	60	40
43	20	6	20	40	60	80
44	40	4	60	60	40	40
45	20	5	40	80	40	80
46	40	4	60	40	40	20
47	40	6	40	0	80	40

``

48	20	5	80	60	60	40
49	20	5	40	20	40	0
50	20	4	60	20	100	80
51	40	4	20	60	60	20
52	20	3	40	80	40	20
53	20	5	60	60	80	40
54	60	3	40	40	80	20
55	40	4	60	60	60	80
56	20	5	40	40	80	80
57	20	5	60	60	40	20
58	60	4	60	80	80	100
59	20	4	40	60	100	80
60	40	3	80	60	60	60

SL.NO	**SSMOS_POST_7**	**SSMOS_POST_8**	**SSMOS_POST_9**	**SSMOS_POST_10**	**SSMOS_POST_11**	**SSMOS_POST_12**
1	60	60	80	80	40	60
3	100	80	100	100	100	20
4	60	60	20	20	20	20
5	40	60	60	40	20	60
6	40	40	60	80	20	80
7	80	40	60	60	0	60
8	60	80	60	80	40	60
9	60	100	40	40	80	40

``

10	40	60	40	60	40	20
11	80	60	40	20	20	40
12	60	100	40	80	80	40
13	60	80	40	80	40	20
14	60	40	60	40	40	20
15	20	60	100	60	40	40
16	40	20	20	60	80	40
17	60	100	100	20	60	20
18	80	60	40	80	60	20
19	80	60	100	20	80	40
20	60	40	0	20	80	20
21	40	60	60	80	60	40
22	60	80	40	20	100	80
23	80	100	20	40	20	20
24	60	40	60	40	100	20
25	60	100	80	60	80	40
26	100	40	20	60	20	40
27	80	60	40	80	60	80
28	60	60	20	40	40	80
29	60	80	0	20	60	20
30	80	100	100	40	100	20
31	40	80	40	100	60	0
32	20	60	20	40	60	60
33	40	80	60	40	60	60

``

34	80	60	40	60	80	40
35	60	40	40	60	60	60
36	60	80	40	60	40	60
38	40	20	20	40	80	60
39	40	60	40	20	20	60
40	40	60	20	40	60	40
41	40	40	80	40	60	60
42	60	60	60	80	20	40
43	40	60	40	0	80	40
44	80	60	20	80	40	60
45	40	40	60	100	80	40
46	40	60	80	40	20	40
47	40	20	80	40	20	60
48	80	20	60	40	60	80
49	80	40	80	0	60	60
50	60	20	80	80	0	20
51	40	40	80	40	60	80
52	80	60	40	80	20	60
53	0	60	60	80	40	60
54	100	60	60	60	20	40
55	100	60	60	40	60	60
56	40	20	80	80	40	0
57	20	80	60	60	80	40
58	20	60	40	80	60	80

``

59	40	60	60	80	60	60
60	60	60	60	60	60	60

``

REFERENCES

Aljasir, B., Bryson, M., & Al-Shehri, B. (2010). Yoga Practice for the Management of Type II Diabetes Mellitus in Adults: A systematic review. *Evidence-Based Complementary and Alternative Medicine : ECAM*, *7*(4), 399–408. https://doi.org/10.1093/ecam/nen027

Andersen, S. R., Würtzen, H., Steding-Jessen, M., Christensen, J., Andersen, K. K., Flyger, H., … Dalton, S. O. (2013). Effect of mindfulness-based stress reduction on sleep quality: Results of a randomized trial among Danish breast cancer patients. In *Acta Oncologica*. https://doi.org/10.3109/0284186X.2012.745948

Ayas, N. T., White, D. P., Al-Delaimy, W. K., Manson, J. E., Stampfer, M. J., Speizer, F. E., … Hu, F. B. (2003). A prospective study of self-reported sleep duration and incident diabetes in women. *Diabetes Care*. https://doi.org/10.2337/diacare.26.2.380

Aziz, Z., Mathews, E., Absetz, P., Sathish, T., Oldroyd, J., Balachandran, S., … Oldenburg, B. (2018). A group-based lifestyle intervention for diabetes prevention in low- and middle-income country: Implementation evaluation of the Kerala Diabetes Prevention Program. *Implementation Science*. https://doi.org/10.1186/s13012-018-0791-0

Barone, M. T. U., & Menna-Barreto, L. (2011). Diabetes and sleep: A complex cause-and-effect relationship. *Diabetes Research and Clinical Practice*. https://doi.org/10.1016/j.diabres.2010.07.011

Beihl, D. A., Liese, A. D., & Haffner, S. M. (2009). Sleep Duration as a Risk Factor for Incident Type 2 Diabetes in a Multiethnic Cohort. *Annals of Epidemiology*. https://doi.org/10.1016/j.annepidem.2008.12.001

Bijlani, R. L., Vempati, R. P., Yadav, R. A. J. K., Ray, R. B., Gupta, V., Sharma, R., … Mahapatra, S. C. (2005). A Brief but Comprehensive Lifestyle Education Program Based and Diabetes Mellitus, *11*(2), 267–274. https://doi.org/doi.org/10.1089/acm.2005.11.267

Bock, B. C., Thind, H., Fava, J. L., Dunsiger, S., Guthrie, K. M., Stroud, L., … Wu, W. (2019). Feasibility of yoga as a complementary therapy for patients with type 2 diabetes: The Healthy Active and in Control (HA1C) study. *Complementary Therapies in Medicine*. https://doi.org/10.1016/j.ctim.2018.09.019

Cappelleri, J. C., Bushmakin, A. G., McDermott, A. M., Dukes, E., Sadosky, A., Petrie, C. D., & Martin, S. (2009). Measurement properties of the Medical Outcomes Study Sleep Scale in patients with fibromyalgia. *Sleep Medicine*. https://doi.org/10.1016/j.sleep.2008.09.004

Carskadon, M. A., & Dement, W. C. (2011). Chapter 2 – Normal Human Sleep : An Overview. *Principles and Practice of Sleep Medicine: Fifth Edition*. https://doi.org/10.1016/B978-1-4160-6645-3.00141-9

Chandwani, K. D., Perkins, G., Nagendra, H. R., Raghuram, N. V., Spelman, A., Nagarathna, R., … Cohen, L. (2014). Randomized, controlled trial of yoga in women with breast cancer undergoing radiotherapy. *Journal of Clinical Oncology*.

``

https://doi.org/10.1200/JCO.2012.48.2752

Colditz, G. A., Willett, W. C., Rotnitzky, A., & Manson, J. E. (1995). Weight gain as a risk factor for clinical diabetes mellitus in women. *Annals of Internal Medicine*. https://doi.org/10.7326/0003-4819-122-7-199504010-00001

De Greef, K., Deforche, B., Tudor-Locke, C., & De Bourdeaudhuij, I. (2010). A cognitive-behavioural pedometer-based group intervention on physical activity and sedentary behaviour in individuals with type 2 diabetes. *Health Education Research*. https://doi.org/10.1093/her/cyq017

Durmer, J. S., Ph, D., Dinges, D. F., & Ph, D. (2005). Neurocognitive Consequences of Sleep Deprivation, *25*(1), 117–129.

Ebrahimi, M., Guilan-Nejad, T. N., & Pordanjani, A. F. (2017). Effect of yoga and aerobics exercise on sleep quality in women with Type 2 diabetes: A randomized controlled trial. *Sleep Science*. https://doi.org/10.5935/1984-0063.20170012

Ehrmann, D. A., Cavaghan, M. K., Barnes, R. B., Imperial, J., & Rosenfield, R. L. (1999). Prevalence of impaired glucose tolerance and diabetes in women with polycystic ovary syndrome. *Diabetes Care*. https://doi.org/10.2337/diacare.22.1.141

Fang, R., & Li, X. (2015). A regular yoga intervention for staff nurse sleep quality and work stress: a randomised controlled trial. *Journal of Clinical Nursing*, *24*(23–24), 3374–3379. https://doi.org/10.1111/jocn.12983

Franken, P., Kopp, C., Landolt, H. P., & Lüthi, A. (2009). The functions of sleep. *European Journal of Neuroscience*. https://doi.org/10.1111/j.1460-9568.2009.06746.x

Fulda, S., & Schulz, H. (2001). Cognitive dysfunction in sleep disorders. *Sleep Medicine Reviews*. https://doi.org/10.1053/smrv.2001.0157

Gross, C. C., Scain, S. F., Scheffel, R., Gross, J. L., & Hutz, C. S. (2007). Brazilian version of the Problem Areas in Diabetes Scale (B-PAID): Validation and identification of individuals at high risk for emotional distress. *Diabetes Research and Clinical Practice*. https://doi.org/10.1016/j.diabres.2006.09.022

Gupta, N., Khera, S., Vempati, R. P., Sharma, R., & Bijlani, R. L. (2006). Effect of yoga based lifestyle intervention on state and trait anxiety. *Indian Journal of Physiology and Pharmacology*.

Harvey, J. N., & Lawson, V. L. (2009). The importance of health belief models in determining self-care behaviour in diabetes. *Diabetic Medicine*. https://doi.org/10.1111/j.1464-5491.2008.02628.x

Hirshkowitz, M., Whiton, K., Albert, S. M., Alessi, C., Bruni, O., DonCarlos, L., … Adams Hillard, P. J. (2015a). National Sleep Foundation's sleep time duration recommendations: methodology and results summary. *Sleep Health*. https://doi.org/10.1016/j.sleh.2014.12.010

Hirshkowitz, M., Whiton, K., Albert, S. M., Alessi, C., Bruni, O., DonCarlos, L., … Adams

``

Hillard, P. J. (2015b). National Sleep Foundation's sleep time duration recommendations: methodology and results summary. *Sleep Health*. https://doi.org/10.1016/j.sleh.2014.12.010

Hobson, J. A. (2005). Sleep is of the brain, by the brain and for the brain. *Nature*. https://doi.org/10.1038/nature04283

Hu, F. B., Meigs, J. B., Li, T. Y., Rifai, N., & Manson, J. A. E. (2004). Inflammatory Markers and Risk of Developing Type 2 Diabetes in Women. *Diabetes*. https://doi.org/10.2337/diabetes.53.3.693

Innes, K. E., & Selfe, T. K. (2016). Yoga for adults with type 2 diabetes: A systematic review of controlled trials. *Journal of Diabetes Research*. https://doi.org/10.1155/2016/6979370

Innes, K. E., & Vincent, H. K. (2007). The influence of yoga-based programs on risk profiles in adults with type 2 diabetes mellitus: a systematic review. *Evidence-Based Complementary and Alternative Medicine : ECAM*, *4*(4), 469–486. https://doi.org/10.1093/ecam/nel103

Jain, S. C., Uppal, A., Bhatnagar, S. O. D., & Talukdar, B. (1993). A study of response pattern of non-insulin dependent diabetics to yoga therapy. *Diabetes Research and Clinical Practice*, *19*(1), 69–74. https://doi.org/10.1016/0168-8227(93)90146-V

kalyan Maiti, Sureshbabu V, R. (2018). Efficacy of Sleep Special Technique on Young Healthy Yoga Practitioners, 42–47.

Kiecolt-Glaser, J. K., Christian, L., Preston, H., Houts, C. R., Malarkey, W. B., Emery, C. F., & Glaser, R. (2010). Stress, inflammation, and yoga practice. *Psychosomatic Medicine*, *72*(2), 113–121. https://doi.org/10.1097/PSY.0b013e3181cb9377

Knight, K. M., Dornan, T., & Bundy, C. (2006). The diabetes educator: Trying hard, but must concentrate more on behaviour. *Diabetic Medicine*. https://doi.org/10.1111/j.1464-5491.2005.01802.x

Li, J., Lepp, A., & Barkley, J. E. (2015). Locus of control and cell phone use: Implications for sleep quality, academic performance, and subjective well-being. *Computers in Human Behavior*. https://doi.org/10.1016/j.chb.2015.06.021

Malhotra, V., Singh, S., Tandon, O. P., & Sharma, S. B. (2005). The beneficial effect of yoga in diabetes. *Nepal Medical College Journal : NMCJ*, *7*(2), 145–147. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/16519085

McDermott, K. A., Rao, M. R., Nagarathna, R., Murphy, E. J., Burke, A., Nagendra, R. H., & Hecht, F. M. (2014). A yoga intervention for type 2 diabetes risk reduction: A pilot randomized controlled trial. *BMC Complementary and Alternative Medicine*. https://doi.org/10.1186/1472-6882-14-212

Pilcher, J. J., & Huffcutt, A. (2018). Effects of Sleep Deprivation on Performance : A Meta-Analysis, *19*(April), 318–326.

Polonsky, W. H., Anderson, B. J., Lohrer, P. A., Welch, G., Jacobson, A. M., Aponte, J. E., & Schwartz, C. E. (1995). Assessment of diabetes-related distress. *Diabetes Care*.

``

https://doi.org/10.2337/diacare.18.6.754

Resnick, H. E., Redline, S., Shahar, E., Gilpin, A., Newman, A., Walter, R., … Punjabi, N. M. (2003). Diabetes and sleep disturbances: Findings from the Sleep Heart Health Study. *Diabetes Care*. https://doi.org/10.2337/diacare.26.3.702

Sahay, B. K. (2007a). Role of yoga in diabetes. *Journal of Association of Physicians of India*.

Sahay, B. K. (2007b). *Role of Yoga in Diabetes* (Vol. 55). Retrieved from www.japi.org121

Salmerón, J., Hu, F. B., Manson, J. E., Stampfer, M. J., Colditz, G. A., Rimm, E. B., & Willett, W. C. (2001). Dietary fat intake and risk of type 2 diabetes in women. *American Journal of Clinical Nutrition*.

Salmerón, J., Manson, J. E., Stampfer, M. J., Colditz, G. A., Wing, A. L., & Willett, W. C. (1997). Dietary fiber, glycemic load, and risk of non-insulin-dependent diabetes mellitus in women. *JAMA*.

Saper, C. B., Fuller, P. M., Pedersen, N. P., Lu, J., & Scammell, T. E. (2010). Sleep State Switching. *Neuron*. https://doi.org/10.1016/j.neuron.2010.11.032

Schiøtz, M. L., Bøgelund, M., Almdal, T., Jensen, B. B., & Willaing, I. (2012). Social support and self-management behaviour among patients with Type 2 diabetes. *Diabetic Medicine*. https://doi.org/10.1111/j.1464-5491.2011.03485.x

Schwartz, J., & Roth, T. (2009). Neurophysiology of Sleep and Wakefulness: Basic Science and Clinical Implications. *Current Neuropharmacology*. https://doi.org/10.2174/157015908787386050

Singh, S., Malhotra, V., Singh#, K. P., Madhu#, S. V, & Tandon, O. P. (n.d.). *Role of Yoga in Modifying Certain Cardiovascular Functions in Type 2 Diabetic Patients*. Retrieved from www.japi.org203

Singh, S., Malhotra, V., Singh, K. P., Sharma, S. B., Madhu, S. V., & Tandon, O. P. (2001). A preliminary report on the role of yoga asanas on oxidative stress in non-insulin dependent diabetes mellitus. *Indian Journal of Clinical Biochemistry*, *16*(2), 216–220. https://doi.org/10.1007/BF02864866

Smith, L., Spelten, E., & Norman, P. (1995). Shiftwork locus of control: Scale development. *Work and Stress*. https://doi.org/10.1080/02678379508256557

Smith, M. T., & Wegener, S. T. (2004). Measures of sleep: The Insomnia Severity Index, Medical Outcomes Study (MOS) Sleep Scale, Pittsburgh Sleep Diary (PSD), and Pittsburgh Sleep Quality Index (PSQI). *Arthritis & Rheumatism*. https://doi.org/10.1002/art.11409

Snoek, F. J., Pouwer, F., Welch, G. W., & Polonsky, W. H. (2000). Diabetes-related emotional distress in Dutch and U.S. diabetic patients: Cross-cultural validity of the problem areas in diabetes scale. *Diabetes Care*. https://doi.org/10.2337/diacare.23.9.1305

Sperling, M. R., Schilling, C. A., Glosser, D., Tracy, J. I., & Asadi-Pooya, A. A. (2008). Self-

``

perception of seizure precipitants and their relation to anxiety level, depression, and health locus of control in epilepsy. *Seizure*. https://doi.org/10.1016/j.seizure.2007.09.003

Strohl, K. P. (2017). Diabetes and Sleep Apnea. *Sleep*. https://doi.org/10.1093/sleep/19.suppl_10.s225

Thind, H., Fava, J. L., Guthrie, K. M., Stroud, L., Gopalakrishnan, G., Sillice, M., … Bock, B. C. (2018). Yoga as a Complementary Therapy for Adults with Type 2 Diabetes: Design and Rationale of the Healthy, Active, and in Control (HA1C) Study. *International Journal of Yoga Therapy*. https://doi.org/10.17761/2018-00026

Touma, C., & Pannain, S. (2011). Does lack of sleep cause diabetes? *Cleveland Clinic Journal of Medicine*. https://doi.org/10.3949/ccjm.78a.10165

Tovote, K. A., Fleer, J., Snippe, E., Peeters, A. C. T. M., Emmelkamp, P. M. G., Sanderman, R., … Schroevers, M. J. (2014). Individual mindfulness-based cognitive therapy and cognitive behavior therapy for treating depressive symptoms in patients with diabetes: Results of a randomized controlled trial. *Diabetes Care*. https://doi.org/10.2337/dc13-2918

Tse, L. M.-S. (2001). The relationship between spiritual well-being and counselor adaptability among Christian counselors., *61*(10-B), 5584.

van Griensven, G. J., de Vroome, E. M., Goudsmit, J., & Coutinho, R. A. (2009). Changes in sexual behaviour and the fall in incidence of HIV infection among homosexual men. *BMJ*. https://doi.org/10.1136/bmj.298.6668.218

Varghese, M. P., Balakrishnan, R., & Pailoor, S. (2018). Association between a guided meditation practice, sleep and psychological well-being in type 2 diabetes mellitus patients. *Journal of Complementary and Integrative Medicine*. https://doi.org/10.1515/jcim-2015-0026

Venkataraman, K., Tan, L. S. M., Bautista, D. C. T., Griva, K., Zuniga, Y. L. M., Amir, M., … Wee, H. L. (2015). Psychometric properties of the problem areas in diabetes (PAID) instrument in Singapore. *PLoS ONE*. https://doi.org/10.1371/journal.pone.0136759

Viala-Danten, M., Martin, S., Guillemin, I., & Hays, R. D. (2008). Evaluation of the reliability and validity of the Medical Outcomes Study sleep scale in patients with painful diabetic peripheral neuropathy during an international clinical trial. *Health and Quality of Life Outcomes*. https://doi.org/10.1186/1477-7525-6-113

Vincent, N., Walsh, K., & Lewycky, S. (2010). Sleep locus of control and computerized cognitive-behavioral therapy (cCBT). *Behaviour Research and Therapy*. https://doi.org/10.1016/j.brat.2010.05.006

Vincent, Norah, Sande, G., Read, C., & Giannuzzi, T. (2004). Sleep locus of control: report on a new scale. *Behavioral Sleep Medicine*. https://doi.org/10.1207/s15402010bsm0202_1

Welch, G. W., Jacobson, A. M., & Polonsky, W. H. (1997). The problem areas in diabetes scale: An evaluation of its clinical utility. *Diabetes Care*. https://doi.org/10.2337/diacare.20.5.760

``

Welch, G., Weinger, K., Anderson, B., & Polonsky, W. H. (2003). Responsiveness of the Problem Areas In Diabetes (PAID) questionnaire. *Diabetic Medicine*. https://doi.org/10.1046/j.1464-5491.2003.00832.x

Yaggi, H. K., Araujo, A. B., & McKinlay, J. B. (2006). Sleep duration as a risk factor for the development of type 2 diabetes. *Diabetes Care*.

Youngwanichsetha, S., Phumdoung, S., & Ingkathawornwong, T. (2014). The effects of mindfulness eating and yoga exercise on blood sugar levels of pregnant women with gestational diabetes mellitus. *Applied Nursing Research*, *27*(4), 227–230. https://doi.org/10.1016/J.APNR.2014.02.002