Effect of Suryanamaskar on Blood Glucose Level and Sleep Quality in Type 2 Diabetes Mellitus Patients.

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ABSTRACT- Background: According to WHO, Diabetes mellitus is chronic, metabolic disease characterized by elevated level of blood glucose or blood sugar, which leads over to serious damage to heart, blood vessels, eyes, kidneys and nerves. The most common is type 2 diabetes usually in adults, which occurs when the body becomes resistance to insulin or doesn't make enough insulin. According the global diabetic community normal fasting blood glucose level is 80-100 mg dl and postprandial blood glucose level is170- 200 mg dl after 2-3hours it will be 120-140 mg dl. In Pre diabetic fasting blood glucose level is 101-125 mg dl and Postprandial blood glucose level is 190-230 mg dl. After 2-3hours will be 140-160 mg dl diabetic fasting blood glucose level is above 126 mg dl and postprandial blood Glucose level is 220 mg dl 3hour will be above 200 mg dl. In the past 30 years, increased late-night use of mobile phones and hectic routines have reduced 18 min of an adult's night time sleep. While 30% adults have reported 'some sleep issues over a year', 10% present with a clinical picture of chronic insomnia. Excessive Daytime Sleepiness (EDS) is the most common repercussion and reflection of impaired nighttime sleep and is commonly seen in people with chronic insomnia, obstructive sleep apnea, narcolepsy, diabetes, and obesity. The research conducted on sleep disorders every year has raised dramatically owing to its in dependent as well as multifactorial causal association with several non-communicable diseases such as cardiovascular disease, type-2 diabetes, obesity and depression. Sleep disturbances often are both the cause and effect of conditions like diabetes, obesity, chronic inflammatory processes, anxiety, and depression.

Methodology: There is 48 subjects were taken. subjects were randomly allocated in two groups, group A (control group) and B (surya namaskar group) each group include 24 subjects. Group A (control group) on oral hypoglycemic tablets and group B (surya namaskar) on surya namaskar session, age range is 40–60-year-old. 12 weeks of surya namaskar protocol was given .(total duration 40min,10min worm up, 20min surya nasmakar,10min of shavasana). As per inclusion criteria and exclusive criteria subjects were taken. Results were calculated.

Results : Mean of sleep quality in diabetes mellitus type-2 patients with surya namaskar group on last day (3.58) and control group on last day (8.12) ,P<(0.0001). mean of blood glucose level in diabetes mellitus type-2 patients with surya namaskar group on last day fasting blood glucose was (126.54) and postprandial was (180.04) and with control group on last day fasting was (134.45) and postprandial was (195.04) ,P<(0.0001).Surya namaskar group shows significant effect to reduce blood glucose level and improve sleep quality in Type 2-Diabetes Mellitus then control group

Conclusion: Present study shows significant effect of surya namaskar on blood glucose level and sleep quality index in type-2 diabetes mellitus.

Keywords: Diabetes patients , diabetes mellitus type-2, glucometer, Surya namaskar, shavasana, sleep, Pittsburgh sleep quality index [PSQI].

INTRODUCTION

According to WHO, Diabetes mellitus is chronic, metabolic disease characterized by elevated level of blood glucose or blood sugar, which leads over to serious damage to heart, blood vessels, eyes, kidneys and nerves.[1] The most common is type 2 diabetes usually in adults, which occurs when the body becomes resistance to insulin or doesn't make enough insulin. In past 3 decades the prevalence of type 2 diabetes has rise dramatically in countries of all income level. India has more diabetic than any other country in the world according to International diabetic Foundation according to recent estimate approximately 51 million people was diabetic in 2010 and by 2030, 87 million people is expected to have diabetic in India keeping in view the alarming increase in incidence of prevalence of diabetic in India the WHO has declared India as the - diabetic capital of the world.[2]

According the global diabetic community normal fasting blood glucose level is 80-100 mg dl and postprandial blood glucose level is 170- 200 mg dl after 2-3hours it will be 120-140 mg dl. In Pre

diabetic fasting blood glucose level is 101-125 mg dl and Postprandial blood glucose level is 190-230 mg dl. After 2-3hours will be 140-160 mg dl diabetic fasting blood glucose level is above 126 mg dl and postprandial blood Glucose level is 220 mg dl 3hour will be above 200 mg dl.[3]

In the past 30 years, increased late-night use of mobile phones and hectic routines have reduced 18 min of an adult's night time sleep. While 30% adults have reported 'some sleep issues over a year',10% present[4]with a clinical picture of chronic insomnia Excessive Daytime Sleepiness (EDS) is the most common repercussion and reflection of impaired night time sleep and is commonly seen in people with chronic insomnia, obstructive sleep apnea, narcolepsy, diabetes, and obesity.[5] The research conducted on sleep disorders every year has raised dramatically owing to its independent as well as multifactorial causal association with several non-communicable diseases such as cardiovascular disease, type-2 diabetes, obesity, and depression.[6] Sleep disturbances often are both the cause and effect of conditions like diabetes, obesity, chronic inflammatory processes, anxiety, and depression[7].

Yoga is holistic discipline that integrate body and mind create perfect balance yoga is not just a physical exercise it built emotional stability and calm the mind.[8] Yoga is powerful health discipline that Heal many health issues withoutmedication it is way of life that boost positive energies and improve quality of life.[9]

It is the dynamic sequence of 12 postures, repeated to make a set of 24 postures. 5 to 10 set are performing at time to promote biological change.[10] Each posture is performed by inwardly chanting and mantra and feeling the hidden power of divinity breath is rhythmically synchronized with movement when practice with the awareness is slow space the gain is physical, mental and spiritual. When practice mechanically in the fast pace, the gain is only physically.[11] In suryanasmaskar 1st asana is namaskarasana (Prayer pose) ,Stand at the edge of your mat, keep your feet together and balance your weight equally on both the feet. Expand your chest and relax your shoulders. As you breathe in, lift both arms up from the sides, and as you exhale, bring your palms together in front of the chest in prayer position ,2nd pose is Hastauttanasana (Raised arms pose) Breathing in, lift the arms up and back, keeping the biceps close to the ears. In this pose, the effort is to stretch the whole body up from the heels to the tips of the fingers.3rd pose is Hastapadasana (Standing forward bend) Breathing out, bend forward from the waist keeping the spine erect. As you exhale completely, bring the hands down to the floor beside the feet.4th pose is Ashwa Sanchalanasana (Equestrian pose) Breathing in, push your right leg back, as far back as possible Bring the right knee to the floor and look up.5th pose is phalkasana (Stick pose) As you breathe in, take the left leg back and bring the whole body in a straight line.6th pose is Ashtanga Namaskara (Salute with eight parts or points) Gently bring your knees down to the floor and exhale. Take the hips back slightly, slide forward, rest your chest and chin on the floor. Raise your posterior a little bit. The two hands, two feet, two knees, chest and chin (eight parts of the body) should touch the floor.7th pose is Bhujangasana (Cobra pose) Slide forward and raise the chest up into the Cobra pose. You may keep your elbows bent in this pose with the shoulders away from the ears. Look up at the ceiling. 8th pose is Adho Mukha Svanasana (Downward facing dog pose) Breathing out, lift the hips and the tailbone up to bring the body into an inverted 'V' pose.9th pose is Ashwa Sanchalanasana (Equestrian pose) Breathing in, bring the right foot forward in between the two hands. The left knee goes down on the floor. Press the hips down and look up.10th pose is Hastapadasana (Standing forward bend) Breathing out, bring the left foot forward. Keep the palms on the floor. You may bend the knees, if necessary.11th pose is Hastauttanasana (Raised arms pose) Breathing in, roll the spine up. Raise the hands up and bend backward a little bit, pushing the hips slightly outward.12th and end pose is Tadasana (Mountain pose) As you exhale, first straighten the body, then bring the arms down. Relax in this position and observe these sensation in your body.

Surya Namaskar is a yoga warm up that refreshes and energizes it limbers the body and mind for asana practice.

NEED OF STUDY

- Type 2 diabetes is due to insulin insensitivity combined with failure of insulin secretion to overcome this by hyper secretion, resulting in relativeinsulin deficiency, there is strong genetic predisposition.[1] Diabetes mellitus put

pressure on the endocrine system it increase level of lipid, glucose and cholesterol which results in obesity due to that Pancreas produces less amount of insulin.[2] The major risk factor for coronary artery disease in diabetes mellitus is dyslipidemia. The characteristic features of diabetic dyslipidemia are a high plasma triglyceride concentration, low High Density Lipoprotein (HDL) concentration and increased concentration of small dense low- density lipoprotein (LDL) particles Insulin resistance leads to increased flux of free fatty acids and hence the lipid changes.[3] The risk of developing type2 diabetes increases with family history of diabetes, obesity, age, hypertension, increased HDL cholesterol level, reduced physical activity , history of gestational diabetes mellitus.[4]

- Ahmet Keskin Concluded that Sleep disorders are common in diabetic patients and negatively affect the control of diabetes. Conversely, poor diabetes control is an important factor disturbing sleep quality.[5] Multiple factors may contribute to insomnia in person with diabetes including discomfort or pain associated with peripheral neuropathy, restlessness leg syndrome, periodic limb movement, rapid changes in blood glucose levels during night leading to hypoglycemic and hyperglycemic episodes, nocturia and associated depression.[6]
- Surya namaskar elongate pancreas which stimulate the production of insulin and producing beta cell increase glucose uptake by the muscular cell which isturns help to promote the weight loss.[7]
- Suryanamakar is an ancient traditional India, psychological, physical and spiritual exercise practice that has been studied for several decades for its role in the management of numerous chronic diseases. suryanamakar is generally safe, simple to learn, and can be practiced by even ill, working or disabled individuals.[8]The disruption of the circadian clock is a factor that could affect the pathogenesis of insulin resistance in skeletal muscle of patients with diabetes.
- Suryanamaskar has been shown to have therapeutic benefits for individuals with a widerange of health conditions. It seems that, yoga improves psychological conditions to manage stress, reduce anxiety, depression, negative emotions, and increase positive emotions and to achieve emotional balance.[9]
- Yoga better the sleep reduce anxiety depression in has the feeling of wellbeing relief from the chronic invest improve digestion circulation immunity improve posture flexibility and strength.[10]
- Kaustubh and Saurabh et.al. shows yoga has beneficial association in various neuropsychiatric conditions like stress, anxiety, depression, post-traumatic stress disorder, stress-related medical illnesses, substance abuse and also in bowel function, improving lipid profile, and diastolic hypertension.[11]
- Yoga enhance concentration and energy and the function of respiration, neurological and endocrine organs as well as increase gastric fire, burn and dissolve excess sugar, regulate the functions of liver and pancreas thus Pancreas produces more amount of insulin.[12]

Hence need arrives to find out the Effect of surya namaskar on blood glucose level and sleep quality in type-2 diabetes mellitus patients.

AIM

- To find out effect of surya namasakar on blood glucose level and sleep quality in Type 2-Diabetes Mellitus patients.

OBJECTIVES

- To find out effect of Surya Namaskar on fasting blood glucose level in Type2-Diabetes Mellitus patients using glucometer.
- To find out effect of Surya Namaskar on postprandial blood glucose level using glucometer.
- To find effect of surya namaskar on sleep quality using Pittsburgh sleep quality index [PSQI].

HYOTHESIS

NULL HYPOTHESIS :-

- There is not significant effect of surya namaskar on blood glucose level and sleep quality in Type-2 Diabetes Mellitus patients

ALTERNATE HYPOTHESIS :-

- There is significant effect of surya

namaskar on blood glucose level and sleep quality in Type-2 Diabetes Mellitus patients.

MATERIAL USED

- Glucometer
- Yoga Mat
- Pen
- Paper
- Sleep quality index

METHODOLOGY

Study design: Experimental study

Sample calculation:-

$$n = \frac{(Z1\text{-}\alpha/2 * \sigma)^2}{MOE}$$

$$n = \frac{(1.96*3.49)^2}{1}$$

$$n = 46.7894$$

Sample size*:* 47
Study set: Diabetic center
Target population: diabetes mellitus patients
Study duration: 6 months
Type of sampling: purposive

INCLUSION CRITERIA:

1. Diabetic patients having fasting blood sugar level more than 126 mg/dl and postprandial blood sugar level more than 200 mg dl having sleep disorder.
2. Diabetic patients having sleep quality index more than 6.
3. Patients having oral hypoglycemic drugs.
4. Diabetes mellitus patients above 40 to 60 years.
5. Both genders.

EXCLUSION CRITERIA:

1. Diabetes mellitus patients with neuropathy, nephropathy and retinopathy.
2. Patient should not participation in sport activities over 20 min or any kind of regular aerobic exercise and resistance training over the last 6 months.

PROCEDURE

- Ethical committee approval was obtained from the institute ethical committee.
- 48 subjects were categorized as per inclusion and exclusion criteria, in which two groups random allocation were done in A (24) and B (24).
- Subjects were given written informed consent form in language understood by them.
- Posture of surya namaskar was explained to the subjects.
- Subjects were given Sleep Quality Index was filled accordingly.
- Data was collected and was put on master chart in Excel sheet and statistical analysis was done.
- Results were calculated.

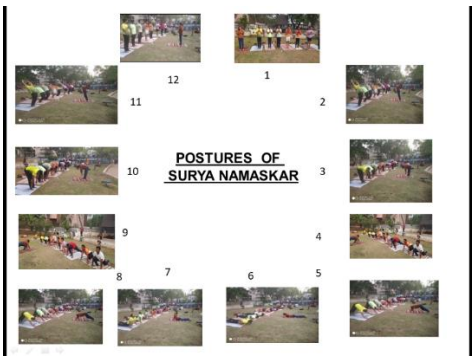
INTERVENTION

48 subjects were taken. Subjects were randomly allocated in two group, Group A (control group) and B (surya namaskar group) each group include 24 subjects.

Group A (control group) on oral hypoglycemic tablets and group B (surya namaskar) on surya namaskar session. Fasting Blood and postprandial blood sample collection was taken before surya namaskar on first day of session.

Surya namaskar started with warm up exercise for 10 min[1]. Explain subjects postures of surya namaskar. After that chanting name of surya, surya namaskar were be started. Dynamic sequence of namaskarasana, hasta uttanasana ,hastapadasana,ashwa sanchalanasana, phalkasana, ashtanga namaskara, bhujangasana, adhomukhashwanasana , ashwa sanchalanasana, hastapadasana, hasta uttanasana, tadasana surya namaskar was done for 20 minutes.[2]
progression of repetition was followed as 5 to 20 per day.[3] Shavasana done After surya namaskar for 10 minutes.[4] Total duration of protocol was 40 min, 3

session per week, total 12 day protocol was given to subjects.[5] Fasting Blood and postprandial blood sample collection was taken on last day of session.



OUTCOME MEASURE

Pittsburgh Sleep Quality Index:-
reliability:0.93-0.98
Validity:0.80
Specificity:0.78 and 0.82
This questionnaire is in an instrument with 7 component and 18 questions. The score of every item is this questionnaire is between 0 to 3 where the score of every component is at most 3. the sum of score means of the seven components accounts for the total score of instrument ranging from 0 to 21. The higher obtained the score, the worsen the sleep quality a score higher than 6 and desirable sleep quality

STASTICAL ANALYSIS

The statistical analysis for the present study were done using Shipro-wilk test.

RESULT

In present study we take 48 type-2 diabetic mellitus patients were randomly allocated in two group, Group A (control group) and B (suryanamaskar group) each group include 24 subjects.

Wilcoxon signed rank test was used to analyse sleep quality index within group 'A', it showed very significant effect on sleep quality index, P< (0.0068). Wilcoxon signed rank test was used to analyse sleep quality index within group 'B', it showed extremely Significant effect on sleep quality index, P< (0.0001).

Wilcoxon signed rank test was used to analyse sleep quality index of last day in-between group, group 'A' and group 'B'. group 'B' showed very Significant result on sleep quality index than group 'A' P< (0.0001).

Friedman rank test was used to analyse fasting and postprandial blood glucose level within group 'A', it showed Extremely Significant effect on fasting and postprandial blood glucose level, P<(0.0001).

Friedman rank test was used to analyse fasting postprandial blood glucose level within group 'B'. it showed Extremely Significant effect on fasting and postprandial blood glucose level, P< (0.001).

Friedman rank test was used to analyse last day of blood glucose level in-between group, group 'A' and group 'B'. group 'B' showed very Significant effect on fasting and postprandial blood glucose level than group 'A', P< (0.0001).

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Table no.1
Interpretation: In above table Group 'A' showed very significant effect on sleep quality index, P< (0.0068).

Variable	Assessment	Sample Size (N)	Mean	Standard deviation	Wilcoxon signed rank test	P-value	Remark
Sleep quality index	1st Day sleep quality index with (A group)	24	8.54166 66667	1.978		0.0068	Considered very Significant

	Last Day sleep quality index with (A group)	24	8.125	1.513			

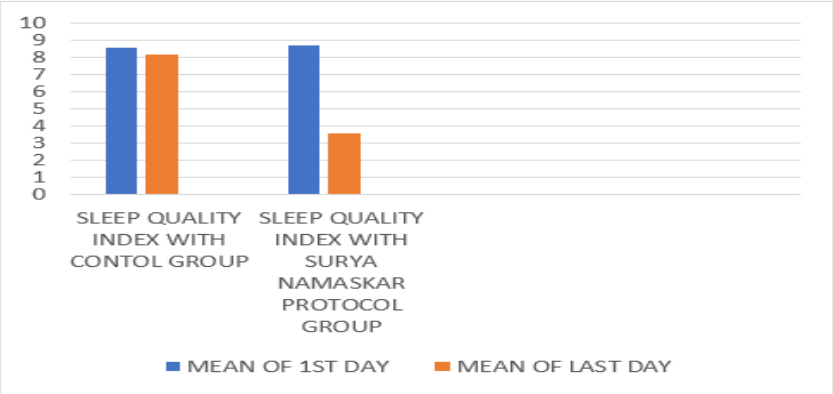

Table no.2
Interpretation: In above table group 'B' showed extremely Significant effect on sleep quality index, P< (0.0001)

Variable	Assessment	Sample Size (N)	Mean	Standard deviation	Wilcoxon signed rank test	P-value	Remark
Sleep quality index	1st Day sleep quality index (B group)	24	8.6666666667	1.971		<0.0001	Extremely Significant
	Last Day sleep quality index (B group)	24	3.5833333333	1.316			

Interpretation: Parameters of both the groups, group 'A' and group 'B' for mean of sleep quality index.

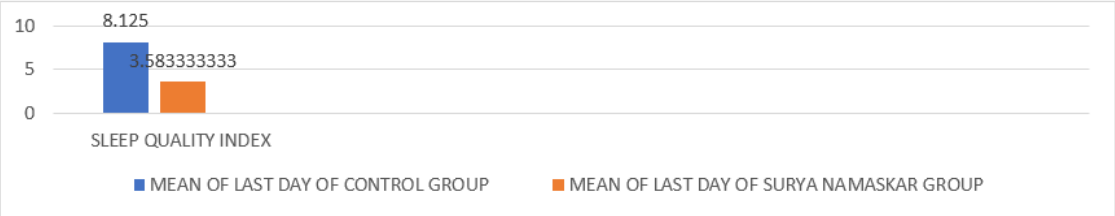

Table no.3
Interpretation: In above table showed last day of group 'A' and group 'B' very Significant result on sleep quality index, P< (0.0001).

Variable	Assessment	Sample Size (N)	Mean	Standard deviation	Wilcoxon signed rank test	P-Value	Remark
Sleep quality index	Last Day sleep quality index (group A)	24	8.125	1.513		<0.0001	Considered very Significant
	Last Day sleep quality index (group B)	24	3.5833333333	1.316			

DISSCUSSION

- Diabetes mellitus is chronic, metabolic disease characterized by elevated of blood glucose level and body becomes resistance to insulin or doesn't make enough insulin[1]. Study was done to analyse the effect of surya namaskar on blood glucose level and sleep quality in diabetes mellitus type-2 patients using Pittsburgh Sleep Quality Index.
- Group 'B' showed very Significant effect on fasting and postprandial blood glucose level than group 'A' in-between group, P< (0.0001).
- Group 'B' showed Extremely Significant effect on fasting and postprandial blood glucose level within group, P< (0.001).
- group 'A' showed Extremely Significant effect on fasting and postprandial blood glucose level within group, P<(0.0001).
- Group 'B' showed very Significant effect on sleep quality index than group 'A'in-between group, P< (0.0001).
- Group 'B' showed extremely significant effect on sleep quality index within group, P< (0.0001).
- Group 'A' showed very significant effect on sleep quality index within group, P< (0.0068).
- The suryanamaskar cause body muscles to absorb the excess glucose in the blood, there by reducing the blood glucose level. They help the pancreas and liver to function effectively, which regulates the blood glucose level.[2]
- They help in rejuvenating the pancreatic cells, thereby assisting insulin secretion. The muscular movements also help in bringing down blood glucose level.[3]
- Suryanamaskar flexibility, agility, relieves fatigue, lethargy, stiffness, and pain, Increases stamina and builds positive energies, develops mind focus, alertness and confidence, Reduces negative energies, excess weight, and burns toxins help to prevent diabetes mellitus number of studies on the effect of yoga in T2DM showed that yogic practices improved pulmonary function, nerve conduction and glycemic control Suryanamaskar improves psychological conditions to manage stress, reduce anxiety, depression, negative emotions, and increase positive emotions and to achieve emotional balance.[4]
- Mohsen and tayebe et.al. Concluded that yoga is also effective to improve sleep quality in type 2 Diabetes mellitus.[5]
- A series of studies by Sahay et. al. have clearly demonstrated the beneficial effects of yoga on decreasing body fat, improved long-term glycemic control, lowering of blood pressure, reduced low-density lipoprotein cholesterol (LDL-C), and very-low-density lipoprotein cholesterol (VLDL-C), and raised high-density lipoprotein cholesterol (HDL-C), along with improved exercise tolerance and reduction of fasting insulin levels. Practicing yoga resulted in decrease BMI, reduced anxiety and improved wellbeing[6].
- Earlier studies have shown that yoga can rapidly reduce stress, decreases depression in the elderly and improves quality-of-life. It reduced level of stress, indicated by the reduction in serum cortisol after yogic intervention is a possible cause for the improvement in glycemic control and insulin sensitivity observed. several researchers have demonstrated the beneficial effects of yogic interventions, involving combinations of complex asanas (body positions associated with yoga practices) and pranayama, with regard to Type 2 DM.[7]
- The sun salutation practice with its sequential movement of the spine in various positions synchronized with breathing promotes limb flexibility with special benefit to beginners and individuals with poor joint flexibility further, there was improvement observed in insulin sensitivity and serum cortisol levels and reduced oxidative stress following yogic intervention[8].

CONCLUSION

Present study shows significant effect of suryanamaskar on blood glucose level and sleep quality index in type-2 diabetes mellitus.

LIMITATION OF STUDY

After suryanamaskar protocol follow up should not taken.

SCOPE IN FUTURE

In rehabilitation program suryanamaskar protocol will be added in type-2 diabetes mellitus patients, so it can be help to control blood sugar level.

REFERNCES

[1] American Diabetes Association. Comprehensive medical evaluation and assessment of comorbidities. Diabetes Care 2017;40 Suppl 1:S25-32.
[2] NCD Risk Factor Collaboration (NCD-RisC).

Worldwide trends in diabetes since 1980: a pooled analysis of 751 population-based studies with 4· 4 million participants. Lancet. 2016;387(10027):1513-30. Sleep Sci. 2017;10(2):68-72 72

[3] Saatcioglu F. Regulation of gene expression by yoga, meditation and related practices: A review of recent studies. Asian J Psychiatry 2013;6:74-7.

[4] Whiting DR, Guariguata L, Weil C, Shaw J. IDF diabetes atlas: global estimates of the prevalence of diabetes for 2011 and 2030. Diabetes Res Clin Pract. 2011;94(3):311-21.

[5] Olivo EL . Protection throughout the lifespan : The psychoneuroimmunologic impact of Indo-Tibetan meditative and yogic practices. Ann N Y Acad Sci 2009;1172:163-71.

[6] Rao RM, Telles S, Nagendra HR, Nagarathna R, Gopinath K, Srinath S,et al. Effects of yoga on natural killer cell counts in early breast cancer patients undergoing conventional treatment. Comment to: Recreational music-making modulates natural killer cell activity, cytokines, and mood states in corporate employees Masatada Wachi, Masahiro Koyama, Masanori Utsuyama, Barry B. Bittman, Masanobu Kitagawa, Katsuiku Hirokawa Med Sci Monit, 2007;13:CR57-70. MedSci Monit 2008;14:LE3-4.

[7] Kitabchi AE, Umpierrez GE, Murphy MB, Kreisberg RA. Hyperglycemic crises in adult patients with diabetes a consensus statement from the American Diabetes Association. Diabetes Care. 2006;29(12):2739-48.

[8] Cohen L, Warneke C, Fouladi RT, Rodriguez MA, Chaoul-Reich A Psychological adjustment and sleep quality in a randomized trial of the effects of a Tibetan yoga intervention in patients with lymphoma. Cancer 2004;100:2253–2260

[9] Sridhar GR, Rao PV. Prevalence of diabetes among rural Indians. In Das S (ed). Medicine Update 2003, vol 13. Mumbai, India: Association of Physicians of India 2003;370–373.

[10] Skomro RP, Ludwig S, Salamon E, Kryger MH. Sleep complaints and restless legs syndrome in adult type 2 diabetics. Sleep Med 2001;2:417-22.

[11] Zimmet P, Alberti KG, Shaw J. Global and societal implications of the diabetes epidemic Nature 2001;414:782–787.

[12] Sadikot SM, Nigam A, Das S, et al. The burden of diabetes and impaired glucose tolerance in India using the WHO 1999 criteria: Prevalence of diabetes in India study (PODIS). Diabetes Res Clin Pract 2004;55:301–307.

[13] King H, Aubert HE, Herman WH. Global burden of diabetes 1995–2005; prevalence, numerical estimates and projection. Diabetes Care 1998;21:1414–1431