Research Article

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ROLE OF YOGA ON CARDIC AUTONOMIC FUNCTION TESTS AND COGNITION IN TYPE 2 DIABETES

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ABSTRACT

According to International Diabetic Federation, type 2 diabetic population is on the rise globally and cognitive decline is one of the complications seen in type 2 diabetes. The present study is aimed at exploring the role of regular practice of yoga on cognition in type 2 diabetes and also to study the relation between the cognition and functional status of autonomic nervous system by considering the Cardiac Autonomic (CAN) function tests. Ten type 2 diabetic subjects of both the sex, aged between 35-55 years, who practiced yoga for a period of six months at Yogi Vemana Yoga Research Institute were recruited as test group. Age and sex matched ten type 2 diabetic subjects were recruited as control group; both the group subjects are on oral hypoglycemic agents. Glycosylated hemoglobin concentration was estimated with Bio-Rad instrument, cognition was assessed with Addenbrooke's Cognitive Examination Revised battery and Cardiac autonomic function tests were also conducted. Unpaired student t test was performed and $p<0.05$ is considered statistically significant. The mean HbA1c concentration in control and test group subjects is 7.8±1.84 and 6.9±0.4% (p=0.03) respectively. Mean cognitive scores in test and control group subjects are 93±4.5 and 85±4.0 (p=0.008) respectively. CAN test results didn't showed any significance between the test and control group. But CAN functions are affected in both the groups. Regular practice of yoga in combination with oral hypoglycemic agents has a positive effect on cognition in type 2 diabetes.

Key words: Addenbrooke's cognitive examination-revised, cardiac autonomic function tests, cognition, yoga

INTRODUCTION

Cognition is very essential in day to day life, and cognitive decline is one of the complications of type 2 diabetes[1]. Apart from the traditional allopathic medicine, alternative therapies like ayurveda is having a positive role in regulating the plasma glucose levels in type 2 diabetes[2]. Combined practice of yoga with oral hypoglycemic agents have added advantage in management and prognosis of type 2 diabetes over administering the oral hypoglycemic agents alone. CAN tests, specifically parasympathetic CAN tests are more sensitive in identifying the functional status of autonomic nervous system in diabetes[3]. Present study is exploring, the effect of yoga on cognitive decline in type 2 diabetes by modulating the functioning of the autonomic nervous system, which will be indirectly assessed by recording the cardiac autonomic function (CAN) tests. This study is hypothesized that the effect of yoga on cognition in type 2 diabetes is by modulating the balance between parasympathetic and sympathetic nervous system.

Aim and objective of the study

- Role of yoga in combination with oral hypoglycemic agents on cognition in type 2 diabetes.
- Effect of yoga on autonomic nervous system in type 2 diabetes, by conducting the cardiac autonomic function tests.
- To find the relation between the cardiac autonomic function tests and cognition in type 2 diabetes.

MATERIALS AND METHODS

It is a case control study.
Study was approved by the institutional ethical committee (Ref No: FWA00002084). Ten type 2 diabetic subjects of both the sex, aged between 35-55 years, who practiced yoga for a period of six months in Yogi Vemana Yoga Research Institute, were recruited as test group. Age and sex matched ten type 2 diabetic subjects were recruited as control group after obtaining the written informed consent, both the group subjects are on oral hypoglycemic agents. To minimize the cultural, socio-economical and educational differences, control group subjects were also selected from the same area.
Inclusion criteria; type 2 diabetes, both the sex, age 35-55. Exclusion criteria; type 1 diabetes, type 2 diabetics on insulin therapy, h/o recent major surgeries, smokers and alcoholics.
Test group subjects have practiced specific yogasanas and pranayama over a period of six months, which were listed in table /figure 1 and 2, in yoga institute under the supervision of a qualified yoga expert, 6 days in a week, and 45-60 minutes per day. The set of yogasanas and pranayama included in the study were based on their positive results in diabetic population, which was proved by the earlier studies[4].

Table 1: List of Yogasanas

S.No	Name of the Yogasana	Duration
1	Dhanurasana	1/2 minute to one minute for the pose being maintained, adding 1/2 minute per week
2	Naukasana	2 - 4 turn of each, the pose being maintained for ten seconds adding one turn each, every fortnight
3	Arthamasthendrasana	¼ minute to one minute for each side, adding ¼ minute per week
4	Bhujangasana	2 - 4 turn of each, the pose being maintained for ten seconds adding one turn each, every fortnight
5	Shavaasana/ Makarasana	3 turn of each, the pose being maintained for 30 seconds

Table 2: List of Pranayama

S.No	Name of the Pranayama	Duration
1	Anuloma-viloma	2-5 minutes
2	Surya anuloma-viloma	5 minutes
3	Chandra anuloma-viloma	5 minutes
4	Nadishuddi pranayama	10 minutes

Glycosylated hemoglobin concentration is estimated with Bio-Rad machine that is based on high performance liquid chromatography (HPLC) principle and HbA1c <6% is non diabetic, between 6-7% considered as good control,>8% requires immediate attention[5]. Cognition was assessed by Addenbrooke's Cognitive Examination - Revised battery (ACE-R), and ACE-R examines the five domains of cognition namely; attention, memory, language, verbal fluency and visuospatial domain. ACE-R was administered by Psychologist in the Psychiatry department. ACE-R contains total score of 100, and scores >88 are considered with normal cognition, between 88-82 are considered with mild cognitive impairment and scores <82 are considered with dementia[6]. Cardiac autonomic (CAN) tests were conducted in the Department of Physiology by a qualified Physiologist. Parasympathetic CAN tests include; Deep Breathing Difference (DBD), Valsalva Ratio (VR) and Postural Tachycardial Index (PTI) and they were conducted with BPL 108 digi ECG machine. Sympathetic CAN tests include; Fall in Systolic Blood Pressure and Rise in Diastolic Blood Pressure and they were conducted with sphygmomanometer and with hand grip dynamometer. Individual CAN test scores are interpreted as if the score is 0 it means the test is normal, 1 is borderline and 2 is abnormal[7].

Statistical Analysis

Statistical analysis was conducted by using Med Calc Statistical Software version 12.7.8 (Med Calc Software bvba, Ostend, Belgium; http://www.medcalc.org; 2014), an unpaired t test was performed to compare the mean difference between test and control group, p value <0.05 was considered as statistically significant.

RESULTS

Mean HbA1c concentration in test and control groups are 6.9±0.4 and 7.8±1.84 (P=0.03) respectively. Mean ACE-R scores in test and control groups were 93±4.5 and 85±4.0 (P=0.008) respectively, ACE-R scores indicate that the test group subjects are having fair cognition and the control group subjects are having mild cognitive impairment.

Table 3: Results of CAN tests with Mean ± SD

Name of the CAN test	Control group	Test group	P value
DBD	7.0±4.6	7.2±5.02	0.89
VR	1.32±0.17	1.26±0.16	0.52
PTI	0.88±0.07	0.84±0.07	0.50
Fall in SBP	3.6±1.67	6.6±6.8	0.37
Rise in DBP	3.4±3.7	2.0±1.58	0.46
Total CAN scores	5.6±1.40	6.6±1.34	0.23

DISCUSSION

Glycosylated hemoglobin concentration is more in control group than in the test group subjects. Regular practice of yogasanas and pranayama, mentioned in table 1 and 2 might have increased the glucose disposal in the peripheral tissues in the test goup[8]. Control group subjects are having mild cognitive impairment whereas test group subjects are having absolutely normal cognition and these findings are in line with the earlier studies[9]. In type 2 diabetes brain metabolites are altered significantly[10]. The cause for cognitive decline in control group subjects may be the alteration of brain metabolites[11 12], and this alteration in brain metabolites is attributed by the hyperglycemia in type 2 diabetes[13-15]. These changes might be by activating the polyol pathway, formation of advanced glycosylated end products, diacylglycerol activation of protein kinase C or by increasing the glucose shunting through hexosamine pathway[16-19]. CAN tests were more or less similar in both the control and test group subjects as shown in the table 3, and this finding is in contradiction with the earlier research[20], so the study could not draw any relation between the cognitive decline and CAN tests in type 2 diabetic population.

CONCLUSION

Combination of regular practice of yoga with oral hypoglycemic agents have better cognitive abilities in type 2 diabetic population over administration of oral hypoglycemic agents alone.

Limitations of the study

We couldn't conduct the cardiac autonomic function tests before and after the practice of yoga sessions, that might be useful in analyzing the effect of yoga on autonomic functions.

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