Life style modification in diabetes mellitus: A Review

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Received on:14-05-2017; Revised on: 24-06-2017; Accepted on: 08-07-2017

ABSTRACT

The diabetes mellitus has reached epidemic proportions worldwide as we enter the new millennium. The World Health Organization (WHO) has commented there is ‘an apparent epidemic of diabetes, which is strongly related to lifestyle and economic change’. Over the next decade, the projected number will exceed 200 million. Most will have type-2 diabetes, and all are at risk for the development of complications. Diabetes represents a spectrum of metabolic disorders, which has become a major health challenge worldwide. Yoga offers the holistic solution to the management of type 2 diabetes mellitus and its complications involving lifestyle changes encompassing kriyas, various asana, changes in diet, management of stress, meditation. Various studies suggest that yoga may improve indices of risk in adults with type 2 DM, including blood sugar levels and reduced resistance to insulin, and improve lipid profiles. Medical research shows that yoga therapy is among effective complementary therapies for several common ailments. Hence it has been concluded that Yoga cannot “cure” diabetes, but there are several ways yoga can be beneficial in controlling diabetes.

KEY WORDS: Yoga, Diabetes mellitus, Blood Lipid Profiles

1. INTRODUCTION

Diabetes mellitus (DM) is plausibly one of the earliest diseases known to mankind. About 3000 years ago it was reported in Egyptian manuscript [1]. In 1936, the difference between type 1 and type 2 DM was clearly made. The type 2 Diabetes mellitus was first described as a component of metabolic syndrome in 1988. Type 2 DM results from the interaction between environmental, genetic and behavioural risk factors [2-4]. The complication of type 2 DM include diabetic ketoacidosis, nonketotic, hyperosmolar coma, heart disease, chronic kidney failure, foot ulcers.Type 2 DM acquires pressing clinical and economic significance due to work loss and disability leading to increased expenditures on medicines and hospital stay. There is a strong impact of psychological and social factors on the progression from Insulin Resistance Syndrome to type 2 DM [5-9]. The prevalence of diabetes is increasing rapidly worldwide and the World Health Organization (2003) has predicted that by 2030 the number of adults with diabetes would have almost double worldwide, from 177 million in 2000 to 370 million [10]. The rise in proliferation is predicted to be much greater in developing than in developed countries (69% versus 20%). In developing countries, people aged 40 to 60 years (that is, working age) are affected most, compared with those older than 60 years in developed countries [11].

Stress causes a build-up in stress hormones found within the body. Pro-oxidants and markers for oxidative tissue damage, such as 8-hydroxy-deoxyguanine, 4-hydroxy-2-nonenal (HNE) proteins, 8-epi-prostaglandin F2, hydro-peroxides, and oxidation of DNA bases, have been reported to be elevated in serum, plasma, white blood cells, and pancreas biopsies of patients with type 2 Diabetes. Compared with non-diabetic control subjects, these markers showed changes that have ranged to fivefold above normal. Paolisso et al. reported that intravenous infusion of GSH in type 2 diabetic patients improved insulin secretion and glucose tolerance during oral glucose tolerance tests [12].

In adult diabetic patients, yoga therapy has shown more beneficial
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Effects and very few adverse effects [13]. Still, the researches on yoga therapy as a complementary alternative medicine in patients with diabetes mellitus are few. As yoga is holistic living incorporating social and lifestyle changes which are subjective measurements, therefore studies on the contribution of yoga in preventing and reducing the complication of lifestyle diseases like diabetes are even fewer. Yoga offers a holistic solution to the management of type 2 diabetes mellitus and its complications. Yogic management of diabetes mellitus involves lifestyle changes encompassing kriyas, various asana, changes in diet, management of stress, meditation and leading a holistic life. The comprehensive yoga, an approach incorporating body postures (asanas), breathing techniques (pranayamas), meditation (affecting the manomayakosa), cleansing (kriyas), nutrition (satvik diet), attitudinal and behavioural modification, and mental discipline, (affecting the vijnanmaya and anandamayakosha) is more beneficial and loyal to its ancient inhabitants [14-17].

2. Yoga systems

Yoga is classified into different systems. Physical and mental exercises are not the only aims of yoga; purity of mind and body are also integral to its practice. To achieve this aim, ancient practitioners have classified yoga into the following subsystems [18]:

- **Yama**: Regulation of mind functions
- **Pranayama**: Regulation of breathing
- **Pratyahara**: Regulation of body systems
- **Dharma**: Consciousness aimed at certain parts of the body
- **Dhyana**: Contemplation/meditation
- **Samadhi**: Higher consciousness, in which the body is completely under the command of the mental process (the deepest state)

In yoga, a physical as well as mental approach is very important in guarding against the adverse impact of stress. Regarding the physical route, hatha yoga mainly consists of various physical postures. Assuming these postures is believed to be advantageous to health by increasing the functioning of internal organs and glands. The mental approach involves meditation and relaxation techniques, known as raja yoga. Both have a similar aim: to promote mental and physical well-being [19].

Hatha yoga strongly influences the central-nervous system through repeated stimulation of somatic and visceral receptors in the cerebral cortex. This may be the reason its practitioners achieve higher levels of performance in body functions [20]. Hatha yoga has had impressive results in decreasing substance abuse, thus perhaps preventing viral infection [21,22]. Muscle relaxation techniques are extremely important in reducing psychological stress. They also reduce systolic and diastolic blood pressure and have a greater role in primary prevention of coronary disease [23-29]. Trilinear relaxation technique, or electromyographic-biofeedback, also plays an important role in managing heart disease. It reduces sympathetic tone and blood pressure, dilates blood vessels, and helps to manage arrhythmias [20].

A healthy diet, regular physical activity, maintaining a normal body weight and avoiding tobacco use are ways to prevent or delay the onset of type 2 diabetes. Diabetes can be treated and its consequences avoided or delayed with diet, physical activity, medication and regular screening and treatment for complications [27].

3. Yoga therapy for diabetes

**Suryanamaskar**

Suryanamaskar, increases the blood supply to various parts of the body and also improving the insulin secretion in the body. It gives all the benefits of exercise if practiced at 3-6 rounds. One round of Suryanamaskar consists of twelve postures. It helps to burn out the calorie.

**Asanas**

Asanas can be beneficial for the diabetic patients. The important facet of Asanas is stability and relaxes the body for long time. Due to various inflection, stretches and strains in the body, the internal organs are stretched and subjected to strain. This increases the blood supply and oxygen supply to the organs, also increasing the efficiency and functioning of the organ. Stretching various glands in the body, results in increased efficiency of the endocrine system.

- **Standing Asana**: Tadasana, Ardhatachakrasana and Trikonasana.
- **Sitting Asana**: Dandasana, Ustrasana, goomukhasana, Vajrasana, Badhakonasana, Paschimottanasana, Ardhamatsyendrasana, JanuSirsasana, Mandukasana
- **Prone**: Mandukasana, Bhujangasana, Salabhasana, Dhanurasana,
- **Supine**: Navasana, Matsyasana, Suptaveerasana, Sarvangasana, Halasana, Savasana.

These asanas have a positive effect on the pancreas and also insulin functioning. And the need maintain the asana for a longer duration while relaxing the muscles.

**Pranayama and meditation**

One of the basic preparations for Pranayama is NadiShodhan Pranayama or alternate nostril breathing; this type is found useful in
diabetes as Alternate nostril breathing has a calming effect on the nervous system, which reduces stress levels, helping in diabetes treatment. Also, research has shown that Bhashrika and BhramariPranayama help in diabetes. Bhramari hascalmed in effect on the brain and nervous system. Bhashrika Pranayama is reinvigoratePranayama, which increases oxygen levels and reduces carbon dioxide levels in the blood[15,16]. Rejuvenation/regeneration of cells of pancreas due to abdominal stretching during yoga exercise, which may increase utilization and metabolism of glucose in peripheral tissues, liver, and adipose tissues through enzymatic process, more active practices followed by relaxing ones lead to deeper relaxation than relaxing practices alone, documented by research from Swami Vivekananda yoga research foundation near Bangalore city and possibility of neuroplasticity bringing about changes in the hypothalimus–pancreatic axis.Muscular relaxation, development and improved blood supply to muscles might enhance insulin receptor expression on muscles causing increased glucose uptake by muscles and thus reducing blood sugar [8,15,28].

Meditation is an important part of yoga practice. As much as stretching and moving help the body rest and rejuvenate meditation is a healing balm for brain chemistry, helping to bring the mind to a state of awakened calm. Meditation and breath techniques are being studied by scientists to discover how they work in helping people relax and lift their spirits. The meditations in Kundalini Yoga are described as benefiting the brain chemistry, the hormonal balance, and the stimulation of communication between the brain hemispheres [22].

The practice of meditation is especially useful in the management of stress. Relaxed and Concentrated state of mind is the aim of any form of meditation which creates a calming effect on the nervous system, brings balance between Sympathetic and Parasympathetic nervous systems. Initially, meditation may be difficult, and one can practice Omkar Chanting, concentration on breathing. In particularly for diabetes, concentration on pancreas during the meditation practice has shown positive effects on sugar levels. One can even visualize the proper functioning of the pancreas, proper insulin administration in the body can help in the treatment of diabetes [20].

Direct influence on pancreatic secretion by the rejuvenation of the pancreatic cells, through alternate abdominal contractions and relaxation, during asana (yogic postures which produce relaxation) and breathing exercises, reduction in blood sugar due to muscular exercise involved in the yoga-asana. Meditation may modulate limbic system activity, which via the hypothalamus may modulate sympathetic nervous system activity and regulate endocrine secretions. Conditioning of these regions by the practice of meditation may help in maintaining the normal homeostatic conditions. The fundamental effect of stress reduction may be an important factor contributing to seizure reduction and EEG changes[29].

4. Effects of Yoga on Blood Lipid Profiles
Yoga and other conventional approaches have impressive effects on carbohydrate, fat, and protein metabolism. They allow more usage of peripheral utilization of glucose, increase fatty acid oxidation, and improve glucose tolerance. Yoga practice also improves compliance with oral anti-diabetic drugs, significantly decreases the need for oral hypoglycaemic agents, decreases incidences of hypoglycaemia as well as improves insulin levels. Although yoga and meditation can be the cure or prevent diabetes, their practice improves glucose metabolism, which is very beneficial in diabetic patients [31-35].

Nisha et al., has carried out a randomized parallel study in Medical College Trivandrum, Kerala, India. Hundred, type 2 diabetics with dyslipidaemia were randomized into control and yoga groups. The control group was prescribed oral hypoglycemic drugs. The yoga group practiced yoga daily for 1 hour with oral hypoglycemic drugs for 3 months. The lipid profiles of both the groups were compared at the start and at the end of 3 months. The result showed a decrease in total cholesterol, triglycerides, and LDL, with an improvement in HDL [36]. Kanta et al., has carried out a study on Seventy volunteers were taken as experimental group from urban area of south Delhi, Gurgaon and Noida region. The subjects were a heterogeneous group having Diabetes, Hypertension, Obesity and joints problem but otherwise healthy and were voluntarily wanted to join Yoga session for general physical mental wellbeing. In this pre- post research study a package of Hatha Yogic Shatkarma technique Dhauti, Neti and Kapalbhati were introduced to them. The volunteers practiced for 90 days. The impact of the practice of Shatkarma practice showed a significant reduction on their serum glucose level and serum cholesterol level[37]. Farther more studies have assessed the potential effects of yoga on blood lipid levels; all proposed that the practice of yoga and yoga-based programs may alter lipid profiles towards betterment. The changes in blood lipid fractions included reductions in cholesterol triglycerides low-density lipoprotein (LDL) and very LDL (VLDL) levels, increases in high density lipoprotein (HDL) levels and reduced LDL/HDL ratio relative to baseline levels and/or control values [8,13,38-40]. An increase in the level of insulin with better uptake of glucose associated with redistribution of fat and reduction in the ratio of waist – hip was observed in type 2 DM patients practicing yoga asanas[41]. The positive response of yoga in the management of hyperlipidemia and obesity cannot just be assigned only to the increased expenditure of calories as yoga does not comprise of generation of energy and accelerated muscle activity[42].
5. Effects of Yoga on Markers of Insulin Resistance

The studies assessing the effects of yoga on insulin resistance markers in patients with type 2 DM have documented considerable improvement in one or more clinical post-intervention measures following the yoga practice either alone or in combination with other therapies and reported significant improvement post-intervention in indices of insulin resistance relative to baseline values. In patients with diabetes mellitus undertaking yoga therapy, the fasting blood sugar levels, as well as post prandial blood sugar levels, are reduced significantly and glycemia levels are also maintained better \[58,49\]. Decreased insulin resistance with the practice of asanas\[49\]. Various studies have documented reductions in fasting and post-prandial blood glucose levels and in fasting glycosylated haemoglobin. Among subjects receiving a yoga-based intervention versus controls receiving enhanced usual care. The reduction in fasting blood glucose is ranging from 6.1-34.4% in various studies \[5,13,35,41,46-51\]. The decrease in the resistance to insulin and increase in the sensitivity to insulin with increased glucose uptake in patients with diabetes mellitus type 2 undergoing yoga therapy regimen. The lifestyle diseases i.e. insulin resistance syndrome, cardiovascular diseases, and atherosclerosis which affect the manomayakosha leading to stress causing an activation of the sympathetic nervous system and a decrease in parasympathetic tone are benefitted with the practice of holistic living of yoga \[5\].

6. Effect of yoga on diabetes complication

Diabetic neuropathies comprise diffuse, symmetrical, predominantly sensory neuropathy often associated with autonomic dysfunction, acute mono-neuropathies, affecting single nerves such as the femoral or oculomotor and pressure palsy, particularly of the median and ulnar nerves\[82\]. Distal symmetrical neuropathy of a clinically significant degree probably affects 20-30% of the diabetic subjects \[53\]. Its prevalence rises with increasing duration, the severity of diabetes \[54-56\] and other include predominance in the male gender, age (irrespective of the duration of diabetes), smoking, associations increasing height and micro-albuminuria\[56,57\]. In a study 20 diabetic neuropathy patients for 40 days of yoga sessions and kept 20 other patients in a control group in a non-randomized controlled study on nerve conduction velocity. Results exhibited improvements among the test group in right and left hand median nerve conduction velocities from 52.81 +/- 1.1 m/sec to 53.87 +/- 1.1 m/sec and 52.46 +/- 1.0 to 54.75 +/- 1/1 m/sec, respectively, whereas the velocities in the control group continued to deteriorate. Furthermore, a better glycemic control was also achieved by the individuals practicing yoga \[58\].

In a study on patients with End Stage Renal Disease (ESRD) who were on dialysis, it was found that 30 minutes of hath yoga practice daily for 4 moths showed significant reduction in oxidative stress (malondialdehyde, protein oxidation, phospholipase A2 activity) and increase in antioxidant activity (superoxide dismutase and catalase activities). This study demonstrated therapeutic, preventative as well as protective effects of Yoga in ESRD through reduction of oxidative stress \[59\]. Another study in endstage renal disease patients reported that yoga reduces cholesterol levels \[60\]. Yurtkuran et al., has reported, 12 week yoga Practice yoga has proven to be safe and significantly effective in managing the pain, fatigue, sleep disturbance along with significant improvement in hand grip, significant reduction in blood urea, creatinine, alkaline phosphatase, and cholesterol \[61\].

Diabetic retinopathy is a possibly blindening complication of diabetes mellitus. Reasons for reduced vision are diabetic maculopathy and complications of proliferative diabetic retinopathy (PDR) such as vitreous hemorrhage, trabecular retinal detachment, and neo-vascular glaucoma. By 2030 developing countries will face an increase of 69% and industrialized countries by 20% of the number of patients with diabetes compared to 2010. For Africa more than 18 million, according to some estimations even 24 million, diabetic patients are predicted for the year 2030\[11,62\]. The probability of retinal complications increases with increasing duration of disease. In 50% of patients with type 1 diabetes and 30% of those with type 2 diabetes potentially vision-threatening retinal changes develop over time, while early retinal changes are not noticed by the patients \[83\]. Diabetic retinopathy is the most common micro-vascular complication of diabetes mellitus and affects between 3%-4% of people in Europe, while the relative risk for developing diabetic retinopathy is higher in type 1 diabetes compared to type 2\[64-66\]. Diabetes mellitus is responsible for about 15% of all cases of legal blindness (best corrected visual acuity less than 0.02) in Germany \[67\]. It is the main cause of blindness within the working-age population in industrialized nations\[68\]. yoga is effective in diabetes retinopathy \[69\]. Yoga postures can lead to improvement in the sensitivity of the β-Cells of the pancreas to the glucose signal and also the improvement in insulin sensitivity in turn can be due to the cumulative effect of performing the postures. Also decrease sympathetic tone, improve peripheral vascular resistance, increase electrical resistance to skin, improve fight or flight response, and increase alpha and theta waves in electroencephalography (EEG)\[70\]. Father more study yoga practices, stretches the lung tissue producing inhibitory signals from action of slowly adapting receptors and hyperpolarising currents. These inhibitory signals coming from cardiorespiratory region involving vagi are believed to synchronize neural elements in the brain leading to changes in the autonomic nervous system; and a resultant condition characterized by reduced metabolism and parasympathetic dominance\[71\].

7. The Effects of Yoga on Cardiovascular system

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Table 1. Glycemic index chart

<table>
<thead>
<tr>
<th>Grain/Starch</th>
<th>Grain/Starch</th>
<th>Vegetable</th>
<th>Fruit</th>
<th>Dairy</th>
<th>Protein</th>
<th>Sweets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>HIGH</td>
<td>LOW</td>
<td>LOW</td>
<td>LOW</td>
<td>LOW</td>
<td>LOW</td>
</tr>
<tr>
<td>Rice Brain</td>
<td>27 Barley flour bread</td>
<td>95 Peas, dried</td>
<td>32 Cherries</td>
<td>32 Yogurt, low fat,</td>
<td>Peanuts</td>
<td>21 Fructose</td>
</tr>
<tr>
<td>Barley, pearl</td>
<td>36 Gnocchi</td>
<td>95 Tomato soup</td>
<td>54 Grapefruit</td>
<td>36 Milk, low fat,</td>
<td>Beans, dried,</td>
<td>22 Strawberry jam</td>
</tr>
<tr>
<td>Spaghetti</td>
<td>38 Grapenuts</td>
<td>96 Marrowfat, dried</td>
<td>56 Apricots, dried</td>
<td>44 Milk, chocolate,</td>
<td>Not specified</td>
<td>40 Cake, sponge</td>
</tr>
<tr>
<td>Protein enriched</td>
<td>38 Stone wheat</td>
<td>96 Peas, green</td>
<td>68 Pear, fresh</td>
<td>53 artificially sweetened</td>
<td>Lentils, not</td>
<td>41 Ice cream, low fat</td>
</tr>
<tr>
<td>Fettuccine</td>
<td>46 Thins</td>
<td>96 Carrots</td>
<td>70 Apple</td>
<td>34 Milk, regular</td>
<td>Specified</td>
<td>41 Specified</td>
</tr>
<tr>
<td>Spaghetti, Wheat</td>
<td>53 Wheat bread</td>
<td>97 Yam</td>
<td>73 Plum</td>
<td>55 Soy milk</td>
<td>Kidney beans</td>
<td>41 Cake, pound</td>
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<tr>
<td>Wholemeal</td>
<td>53 Taco shells</td>
<td>97 Sweet potato</td>
<td>77 Peach, fresh</td>
<td>60 Milk, skin/nonfat</td>
<td>46 Butter beans</td>
<td>43 Oatmeal cookies</td>
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<tr>
<td>Fruit’n Oats</td>
<td>55 Commeal</td>
<td>98 Sweet corn</td>
<td>78 Orange</td>
<td>63 Yogurt, low fat,</td>
<td>45 Split peas,</td>
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</tr>
<tr>
<td>Wheat kernels</td>
<td>55 Cream of wheat</td>
<td>100 Boiled</td>
<td>81 Peach, canned</td>
<td>66 Fruit sugar sweet</td>
<td>Yellow, Boiled</td>
<td>52 Power Bar</td>
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<tr>
<td>All-bran</td>
<td>60 White bread</td>
<td>100 Potato, new</td>
<td>81 Kiwifruit</td>
<td>75 Milk, chocolate,</td>
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<td>52 Pastry</td>
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<tr>
<td>Macaroni</td>
<td>64 Golden Grahams</td>
<td>100</td>
<td>87 MODERATE</td>
<td>107 Cantaloupe</td>
<td>93 Ice cream</td>
<td>52 Muesli Bar</td>
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<tr>
<td>Linguine</td>
<td>65 Water Crackers</td>
<td>102 BEETS</td>
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<td>107 Pineapple</td>
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<tr>
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The various studies have reported significant improvement in both systolic and diastolic blood pressure as compared to baseline values in patients with type 2 diabetes mellitus who undertook comprehensive residential three-month kriya yoga training and vegetarian nutrition. The study interventions emphasized on a yogic vegetarian diet, kriya yoga, stress management and group support. Similar, findings of a reduction in systolic and diastolic blood pressure in patients with type 2 diabetes mellitus and coronary heart disease were also endorsed by [8,40,42,45] other studies observed the beneficial effect of meditation in patients of hypertension; however, it was also observed that this effect lasts till the patient practices meditation. The patients with type 2 DM and hypertension also showed remarkable improvements after two to three weeks of yoga practice by a decrease in both systolic and diastolic blood pressure associated with the reduction in dose of antihypertensive medication [72].

8. Diet
Diet plays an important role in the management of diabetes as it exerts a direct influence on the blood glucose level. The goal of diet therapy is to maintain and prolong a healthy, productive and happy life. Regular small meals complex carbohydrates such as wheat, beans, oatmeal, corn, and brown rice, avoid refined foodstuff, junk food simple sugars such as white sugar, honey glucose, and sweet maintain good hydration. The American Diabetes Association recognizes that education about glycemic index and glycemic load occurs during the development of individualized eating plans for people with diabetes. Some organizations specifically recommend use of low glycemic index diets. Further, studies used varying definitions of low and high glycemic index, and glycemic response to a particular food varies among individuals and can also be affected by the overall mixture of foods consumed[30].

9. CONCLUSION
To conclude, in many studies including the control diabetes movement by yoga therapy suggest that yoga therapy has a beneficial effect in patients of type 2DM in terms of reducing the blood sugar levels and insulin resistance and increasing the sensitivity to insulin. Yoga also has a positive effect on lipid profile in type 2 DM [32].

Yoga therapy is effective in promoting health and management of diabetes and yields manifold benefits with very few adverse effects. However, any single intervention is not adequate to a certain long-term behaviour change. Environmental and social factors, yoga and other lifestyle changes are also important for optimal management of diabetes. However high-quality randomized control trials are needed to validate and explain the effects of standardized yoga programs in patients with type 2DM [35].

To conclude Yoga is a valuable adjunct to treating a variety of disorders which are effectively behaviourally induced lifestyle diseases including diabetes mellitus. Therefore, Yoga practices should be incorporated as an adjunct treatment, as a mind-body therapy in coordination with allopathic medicine as it has the potential to enhance its beneficial effects. At present time, due to the advancement of science, technology, and medicine, they are just like forgotten yoga therapies. Even though certain limited research on such types of approaches has established the definite role, more research must be designed to prove original efficacy. Yoga practice would be beneficial effective in patients of type 2DM and Diabetes complications like diabetic neuropathy, nephropathy and retinopathy and blood pressure [45,50,52].

Yoga, meditation, breathing exercise or other mind-body exercises had been used for the spiritual way of living. At present time, due to advancement of science, technology and medicine, they are just like forgotten therapies. Even though certain limited research on such types of approaches have established definite role, more research must be designed to prove original efficacy[41].

REFERENCES


Source of support: Nil; Conflict of interest: None Declared