



Beneficial Effects of Vestibular Exercise Along with Yoga on Diabetes Mellitus: A Review

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Diabetes Mellitus (DM) is becoming one of the major growing health issues due to an unhealthy lifestyle. DM can be controlled through regular yoga practice. Yoga has a therapeutic effect on DM and other metabolic disorders. Vestibular exercises (VE) are a type of exercise concerned with the stimulation of the vestibular system. Studies show Vestibular stimulation will prevent DM and associated complications. Vestibular exercises are also a part of yoga but it is not using in yoga therapy for DM. The inclusion of Vestibular exercises in diabetic yoga may effective for DM patients. Regular yoga practice can prevent or delay the development of DM by increasing glucose uptake by cells, reducing oxidative stress, improving physical fitness, reducing stress, etc... Vestibular stimulation also reduces the chance of DM by increasing insulin secretion through vagal stimulation and sympathetic inhibition, reducing stress, modulation of autonomic activity, promoting sleep, etc. A combination of Vestibular exercise and Yoga postures may give a combined effect of both. So it is beneficial rather than Vestibular exercise alone or yoga postures alone.

Keywords: Diabetes mellitus; yoga; vestibular exercise; vestibular stimulation.

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1. INTRODUCTION

Diabetes Mellitus (DM) is one of the major growing health issues [1]. This is due to an unhealthy lifestyle [2]. Studies show in 2030, about 578 million people will have diabetes. And the number will increase by 700 million in 2045 [3]. This increase may cause personal, social, and economical problems [4]. DM is a metabolic disorder that is related to inadequate insulin secretion. So it is characterized by hyperglycemia [5]. Hence, Anti-diabetic drugs are used for the treatment to control blood glucose levels. The drugs include (Metformin) and other drugs like Exenatide, and Pramlintide [6]. Hypoglycemic drugs may affect adversely [7].

DM can be controlled through regular yoga practice [8]. It has a therapeutic effect on DM and other metabolic disorders [9]. Yoga is not only a physical exercise but also an experimental science that balances the body and mind [10]. It includes eight steps. They are,

- 1.Yama (Codes of restraint, abstinences, self-regulations)
- 2.Niyama (Observances, practices, self-training).
- 3.Asana (Meditation posture)
4. Pranayama (Breathing exercises)
- 5.Pratyahara (Withdrawal of the senses, bringing inward)
6. Dharana (Concentration)
7. Dhyana (Meditation) and
8. Samadhi (Meditation in its higher state) [11].

Vestibular exercises (VE) are a type of exercise concerned with the stimulation of the vestibular system [12]. Studies show Vestibular stimulation will prevent DM and associated complications [13]. Vestibular exercise includes side to side, up and down and rotatory movements of the neck and eyeballs, Lean forward and backward, lying down on back then shift to the right side, then to the left side, etc [14]. These exercises are also coming under yoga practice [15]. But Diabetic yoga includes other yoga postures and pranayama only [16]. Most of these postures are difficult for old-aged people. If we can include these vestibular exercises in diabetic yoga, we can simplify the practice for old-age people.

Regular yoga practice can prevent or delay the development of DM by increasing glucose uptake by cells, reducing oxidative stress, improving physical fitness, reducing stress, etc [16]. Vestibular stimulation also reduces the chance of DM by increasing insulin secretion through vagal stimulation and sympathetic inhibition, reducing

stress, modulation of autonomic activity, promoting sleep, etc [17]. Doing vestibular exercise along with yoga may provide a combined effect and reduces the risk of DM effectively.

2. YOGA POSTURES AND VESTIBULAR EXERCISE IN DIABETES

Yoga has been continuing since ancient eras. But yoga therapy is a new field that is developed after exploring the beneficial effect of yoga in biochemical, electrophysiological, cellular, genetic, neuromuscular, and radiological parameters. Yoga is not a treatment. Yoga therapy is the treatment procedure that is the practical application of yoga in different health problems [18].

Yoga postures (Yoga Asanas) include different body movements by focusing on the breath. Yoga postures showing a beneficial effect on DM include ardhmatsyendrasan, yoga mudra, mandukasan, vakrasan, Paschimothanasan, Dhanurasan, Ardhakadichakrasan, etc. Some sitting and standing postures which give massage to the pancreas and stimulates the pancreas. Thus insulin secretion increases by increasing β cell sensitivity to glucose [19]. Increase in blood supply to the muscle and high energy requirement during yoga practice causes an increase in glucose uptake by cells [20]. To get its benefit, hold 30 seconds to 1 minute in one posture according to the capacity of an individual [21]. It is believed that Abdominal stretch occurs during yoga postures may cause regeneration of pancreatic cells [22].

Vestibular stimulation can increase insulin secretion. Vestibular stimulation causes a response in the ipsilateral vagus nerve. The vagus nerve innervates the pancreatic islets. So vagal stimulation causes insulin secretion [23]. Vestibular stimulation can inhibit locus coeruleus (LC) noradrenergic neurons and increases the release of gamma-aminobutyric acid (GABA) from the substansianigra. GABA can inhibit LC nor-adrenergic neurons. Finally, sympathetic inhibition occurs. It leads to an increase in insulin secretion [24].

3. PRANAYAMA AND VESTIBULAR EXERCISE IN DIABETES

Pranayama is a breathing exercise in yoga practice. It includes anulomvilom (alternate nostril breathing), sitkari (cooling breaths), bhramari (humming bee breath), Bhastrika

pranayama (bellow-breathing) etc. It can control the autonomic nervous system (ANS) [25].

Studies show that Kapalbhathi Pranayama has a beneficial effect on Diabetic patients. This may be due to the change in abdominal pressure during Kapalbhathi. Change in abdominal pressure may stimulate the pancreas [26].

Bramari pranayama makes a vibration. It helps for mind relaxation and it is a method to reduce stress. Stress can accelerate the development of DM by stimulation of the hypothalamic-pituitary-adrenal (HPA) and sympathetic axes and parasympathetic withdrawal. As a result raise in cortisol, epinephrine, norepinephrine, growth hormone, glucagon, catecholamines, prolactin, leptin, and neuropeptide Y occurs [27].

Pranayama may also lower oxidative stress, decrease sympathetic activation, and improve nervous system function. It can enhance sleep and quality of life. Very few studies have examined the effects of pranayama on psychological status and sleep [28-30].

Vestibular stimulation can reduce stress effectively by inhibiting the HPA axis through the release of GABA [31]. Vestibular stimulation causes a reduction in cortisol. Cortisol secretion is associated with stress. Cortisol reduction indicates stress relaxation [32].

Vestibular stimulation reduces adrenaline, non-adrenaline and cortisol level in the blood which is termed as stress hormones. This helps for the improvement in insulin action [33].

4. VESTIBULAR EXERCISE AND YOGIC DIET IN DIABETES

Diet has a greater role in the etiology of Diabetes [34]. DM can be controlled through healthy food intake so the Diet has an important role in diabetic management [35]. Unhealthy eating habits and physical inactivity are lead to diabetes [36].

Yoga is related to healthy food habits and physical activity [37]. A balanced diet is also a part of yoga. Yoga promotes a diet including fruits and vegetables. A yogic diet facilitate improvements in diet control, weight loss, and blood glucose level [38].

Yoga categorizes food into three based on thri gunas. That includes Sattva, Rajo, and Tamo. Yoga promotes Sattvic foods. Sattvic food means fresh and pure food with rich vitamins and

minerals. Fast food, junk food, and foods that sitting in the fridge for more days are coming under tamasic foods [39].

Vestibular stimulation plays an important role in food intake [40]. Obesity is observed in DM due to insulin resistance. Vestibular stimulation inhibits food intake and, finally, controls obesity [41].

The vestibular system has a connection with the hypothalamus dorsal raphe nucleus, nucleus tractus solitarius, locus coeruleus, hippocampal formation. So vestibular stimulation can regulate food intake [42].

5. CONCLUSION

Yoga has a therapeutic role in the management of DM. The above-mentioned evidence suggests that vestibular stimulation has a beneficial effect on DM. The vestibular nerve can be stimulated through vestibular exercises. So vestibular exercise can prevent DM and its associated risk factors. Vestibular exercises are a neglected subject in the field of diabetic yoga. This review suggested Vestibular exercise along with yoga effectively controls DM and reduces difficulties in yoga practice. Thus we can reduce the use of medication.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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