A REVIEW ON INFLUENCE OF VESTIBULAR EXERCISE ON DIABETIC PATIENTS.

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ABSTRACT

Spread of Diabetes Mellitus is higher in society. Physical inactivity is one of the cause for DM. DM can be managed through a healthy lifestyle. Among healthy lifestyle exercise is one of the important factor. Now a days exercises has been removed due to busy lifestyle.

Vestibular exercises are the simple exercises which can do along with daily activities like travelling, watching TV etc.. VE are concerned with the stimulation of the vestibular nerve. It is one of the easiest and inexpensive method for vestibular nerve stimulation.

Development of DM can be prevent by Vestibular stimulation. It can be easily done by DM patients without expenditure of time during their busy lifestyle. Neuro-endocrine modulation through vestibular exercise will be effective for management of DM and complications associated with DM.

Keywords: Diabetes, Vestibular exercise, vestibular stimulation.

I. INTRODUCTION

The health status of the Indian population is becoming worse. Outspread of lifestyle diseases is the major health issue. Among lifestyle diseases, the spread of Diabetes Mellitus (DM) is higher in society. Diabetes is a metabolic disease that is characterized by an increase in blood glucose level, which is resulting from defects in insulin secretion or action. DM may cause various physiological and biochemical complications in the body. A high risk of DM can be managed through a healthy lifestyle.

Vestibular apparatus present in the inner ear which consists of Semicircular canal, utricle, and saccule, which maintains posture and body balance. Vestibular exercises (VE) are concerned with the stimulation of the vestibular nerve. Other vestibular stimulation method includes caloric, linear, rotatory, and electric vestibular nerve stimulation (VeNS). Studies show vestibular nerve stimulation can prevent the development of diabetes.

Here we are reviewing the effectiveness of VE as a diabetes management method. Because VE is a simple technique we can do at any time. It is an inexpensive and simple technique compared with other physical exercises.

II. REVIEW FINDINGS

The review findings are as follows:

Vestibular exercise

The main objective of the VE is to maintain abnormalities within the vestibular system. And vestibular exercises help to stimulate the vestibular apparatus. Vestibular exercises include the following,
Head exercises.

Sit in a bed or a comfortable place. And turn your head from side to side. Then move the head up and down.

Rotate head clockwise and anticlockwise.

Shrug and circle the shoulders.

Lean forward

Sit comfortably and lean forward, then pick up an object from the ground.

Change from sitting to a standing position. Then back again.

Eye exercises.

Sit comfortably and move your eyes up and down and side to side. (Head is still)

Eyes close and open

Bend forward and pick up objects from the ground.

Walk up and down through a slope and steps.

Throw and catch a ball Etc...\textsuperscript{11,12}

**VE on complications associated with DM.**

The effect of VE on different complications associated with DM described under following subheadings.

**VE for Blood Glucose level control**

A high blood glucose level is the earliest symptom of DM. So most of the people diagnosed with DM are under blood-glucose-lowering treatment.\textsuperscript{13}

Vestibular nucleus projects to the nucleus tractus solitarius (NTS) and dorsal motor nucleus of the vagus nerve (DMV) which leads to vestibular influences on autonomic function.\textsuperscript{14} DMV can control both exocrine and endocrine secretions by pancreas.\textsuperscript{15} NTS-to-DMV connections coordinate parasympathetic motor output and act like a neurobiological substrate for vago-vagal reflexes.\textsuperscript{16} Efferent vagal stimulation prevents an increase in blood glucose level.\textsuperscript{17}

![Fig: 1. diagram showing the essential components of the pancreatic vagovagal reflex](image)

Controlled vestibular stimulation is effective for blood glucose level management. Vestibular stimulation causes an increase in AMP-activated protein kinase which helps to control glucose metabolism.

VE for Fat metabolism

Alteration in fat metabolism during DM causes a change in plasma lipid level in diabetic patients. Hyperlipoproteinemia is observed in DM patients. Lipoprotein lipase activity diminishes during insulin deficiency and leads to hyperlipidemia in DM. Vestibular stimulation shows a beneficial effect against anti hyperlipidemia in Wistar albino rats. studies show the level of triglyceride and HDL is increased and LDL and Total cholesterol have no change after linear vestibular stimulation.

VE for obesity and weight management

Diabetes is associated with obesity. Insulin resistance observed during DM is associated with obesity. An increase in BMI in early life leads to the development of DM. Vestibular stimulation is effective management of obesity, DM, and related metabolic diseases. Animal studies show impaired vestibular system leads to obesity in high-sucrose/high-fat diet mice. Vestibular nerve stimulation may effectively reduce obesity and excess body fat.

VE for the Management of postural stability

Postural sway and falls are the complications associated with diabetes, especially for elder adults with DM. Inferior colliculus, red nucleus, and periaqueductal gray matter, and interstitial nucleus of Cajal are the Midbrain structures that are integrated by vestibular stimulation. Thus maintains balance. Studies show vestibular exercises can induce a beneficial effect on postural stability. Diabetic Peripheral Neuropathy (DPN) is associated with postural instability, gait imbalance, and sensory-motor function deficit. So fall incidence is common in DPN. Because gait and balance are influenced by cognitive and attention impairement. Vestibular diseases and poor presentation in balance test causes physiological deterioration in cognitive skills. Vestibular system is connected with cognitive function. Vestibular stimulation can improve cognitive function.

VE for Diabetic Neuropathy

An increase in blood glucose level during DM causes nerve injury called Diabetic neuropathy(DN). Different type of DN includes peripheral neuropathy, autonomic neuropathy, Proximal neuropathy (diabetic polyradiculopathy), and Mononeuropathy (focal neuropathy). Pain, numbness in limbs, etc.. Are the symptoms of DN. The risk of falls is very high in DN. Balance impairment in older people with DN is the reason behind the risk of fall. Vestibular exercises can prevent the risk of falls and maintain body balance and gait. So balance exercises along with medication will be effective for DN. Vestibular stimulation may reduce pain associated with DN. Studies show the beneficial effect of vestibular stimulation on pain releaf.

VE for Sleep

Sleep disturbance is observed in DM patients. Inadequate sleep decreases insulin sensitivity. Which leads to impaired glucose tolerance. As a result, the chance of DM is increased. Vestibular system has interaction with sleep through orexinergic postural control.
The vestibular system has some effect on circadian rhythm. Orexinergic modulation of the vestibular nuclei is linked with postural control and the vestibular inputs influence the sleep-wake state switch. Abnormal sleep duration has been reported in patients with vestibular vertigo.

III. CONCLUSION

From the higher introduced evidence, it is concluded that vestibular stimulation is effective for the management of DM. Vestibular exercise is the easiest, inexpensive, painless and non-invasive method for vestibular stimulation. So we concluded vestibular exercises may manage the development of DM and the complications associated with DM.

REFERENCES


