MEDWIN PUBLISHERS
Committed to create value for Researchers

International Journal of Biochemistry & Physiology
ISSN: 2577-4360

Effect of Selected Vestibular Exercises on Depression, Anxiety and Stress in Elderly Women with Type 2 Diabetes

Sai Sailesh Kumar Goothy[1]*, Padmanabha BV[2], Srilatha Goothy[3] and Mukkadan J K[4]

[1]Department of Physiology, R.D Gardi Medical College, India

[2]Department of Physiology, Faculty of Medicine, Northern Border University, Ar'ar-Kingdom of Saudi Arabia

[3]Department of Biochemistry, R.D Gardi Medical College, India

[4]Department of Research, Little Flower Medical Research Centre, India

***Corresponding author:** Dr. Sai Sailesh Kumar G, Assistant Professor, Department of Physiology, R.D Gardi Medical College, Agar Road, Ujjain, M.P, India, Email: dr.saisailesh@gmail.com

Research Article

Volume 4 Issue 4

Received Date: October 28, 2019

Published Date: November 20, 2019

DOI: 10.23 880/ijbp-16000169

Abstract

Objective: The present study aimed to observe the effectiveness of vestibular exercises on sleep quality and quality of life in elderly women with type 2 diabetes.

Materials and methods: 40 elderly women with type-2 diabetes were recruited for the study after written informed consent by convenient sampling. Participants acted as self-controls. The following criteria were followed while selecting the participants. Vestibular exercises comprises of 45 minutes one session. Two sessions per week was administered to the participants for a period of one month. Depression, anxiety and stress levels were assessed using DASS-42.

Results: Depression, anxiety and stress levels were significantly decreased followed by the vestibular exercises.

Conclusion: There was a significant decrease in the depression, anxiety and stress followed by the exercises. Further studies are recommended in this area to recommend vestibular stimulation for the benefit of elderly in general.

Keywords: Vestibular Exercise; Stress; Elderly Women; Diabetes

Introduction

Vestibular system comprises three major components, the Peripheral sensory apparatus, Central processing system and motor output system. The Peripheral sensory apparatus (the Hair cells) detects and relays information about head angular and linear velocity to the higher centre in the brain [1]. The Central processing system processes information in conjunction with other sensory inputs for position and movement of head in space. Motor output system generates compensatory eye movements and compensatory body movements during head and postural adjustments through mainly three reflexes i.e., vestibule ocular reflex, vestibulocolic reflex and vestibulospinal reflex). Vestibular stimulation is the input that body receives when you experience movement or gravity [2]. Nodding head or climbing stairs results in mild vestibular stimulation while activities such as

skydiving or being on a rollercoaster offers intense vestibular stimulation. In our day today life, various simple and natural activities like walking, running, dancing, swinging, rocking, or slow/gentle spinning in one direction, jumping, bouncing, playground activities like the teeter totter, slide or climber, sports and games like hopscotch, soccer, hockey or tag etc., can stimulate the vestibular system. Vestibular input has a great impact on arousal. Intense vestibular input may lead to over arousal and too little vestibular input may lead to under arousal. Hence vestibular stimulation should be optimally balanced. It was reported that controlled vestibular stimulation provides more soothing effects (Pederson, educational resources information centre) [3]. Stimulating vestibular system by controlling direction duration, frequency and intensity have proven benefits such as decreased self-stimulation, decreased hypersensitivity, increased postural security, increased concentration and attentiveness, increased balance, increased body awareness, calming effects, reduction of abnormal muscle tone at slow speeds and increased alertness at high speeds [4]. The present study aimed to observe the effectiveness of vestibular exercises on postural stability in elderly women with type 2 diabetes.

Materials and Methods

Study Setting: The present study was conducted at Little Flower Medical Research Centre, Angamaly.

Study Design: Pre and post without control design. The participants acted as self-controls. After recording the baseline values, vestibular exercises were practiced by the participants for one month. Post values were recorded after one month.

Study Participants: 40 elderly women with in the age group of 45-55 years with type-2 diabetes were recruited for the study after written informed consent by convenient sampling. Participants acted as self-controls. The following criteria were followed while selecting the participants.

Inclusion Criteria: Elderly women with type 2 diabetes and able to walk for minimum three minutes without any support (minimum 30 steps) and those without any cognitive impairment and willing to participate were included in the study.

Exclusion Criteria: Those with severe medical complications and vestibular disorders were excluded from the study.

Vestibular Exercises: Each session of exercises comprises of 45 minutes. Two sessions per week was administered to the participants for a period of one month. The exercise comprises of three steps.

Step One: The participants were asked to lie down on their back, the participants shifted to lying on their right side, then to their left side. This cycle was repeated for ten times. Following this 3 minutes rest was given while lying on right side. Again the process was repeated and this time during rest the participant lies to his left side for 3 minutes. Then same procedure was also performed with closed eyes.

Step Two: The participant was asked to sit with legs extended straight and bend alternatively to right and left sides while the arms resting on the mat behind the body. After ten times, three minutes rest was given. During these three minutes the participants was in side-bend position to right side. After the rest, the participants repeated the side bends for ten times and again three minutes rest was given. During this three minutes rest, the participant was in side-bend position to left side.

Step Three: The participants were in sitting position and asked to move head up and down directions slowly and gently while eyes are closed. This was performed for ten times and followed by three minutes rest. Then the participant's moved his head to sideways for ten times slowly and gently while eyes are closed.

Outcome Measures

Depression, Anxiety and Stress: Depression, anxiety and stress levels were assessed using Depression, anxiety stress scale (DASS)-42 questionnaire.

Ethical Consideration: The present study was approved by institutional ethical committee. Informed consent was obtained from all the participants. Confidentiality of the data was maintained.

Data Analysis: Data was analyzed using SPSS 20.0. Paired t test was used to observe the difference between the groups. Probability value less than 0.05 was considered as significant.

Results

Results were presented in table no 1. Depression, anxiety and stress levels were significantly decreased followed by the vestibular exercises.

Parameter	Pre-intervention (n=40)	Post-intervention (n=40)	P value
Depression	18.44±3.56	12.62±2.54	<0.0001***
Anxiety	9.72±1.34	6.62±2.51	<0.0001***
Stress	22.81±4.58	17.11±5.99	<0.0001***

Table 1: Depression, anxiety and stress score of the participants. (***P<0.001 is significant).

Discussion

About 1/3rd neurons in the central nervous system are sensitive to vestibular stimulation and Parieto-Insular Vestibular Cortex (PIVC) is considered as the principal vestibular cortex [5]. The PIVC is located differently in different species like in Squirrel Monkey PIVC is located in the lateral sulcus, on its temporal tip in Platyrrhini, Anterior Supra-Sylvien cortex in cats and In humans fMRI studies show activation of the temporo-parietal junction (i.e., the superior temporal gyrus, posterior insula, inferior parietal lobule. Based on vestibular inputs PIVC integrate body motion independent of head movement. In humans, this area could also integrate vestibular input involved in mental rotation tasks in an egocentric reference frame [6]. The posterior parietal cortex plays a key role in spatial representation and encodes precise self-motion and acceleration states [7]. Apart from neuroanatomical connections vestibular system influences neurotransmitter systems such as serotoninergic, dopaminergic, histaminergic, GABA minergic and cholinergic systems. It was observed that there is a rise in serotonin level in the medial vestibular nuclei following caloric vestibular stimulation and Vestibular nucleus neurons do respond to of the dorsal raphe nuclear stimulation which is a key source of serotonergic input [8]. It is reported that lack of Serotonin and brain derived neurotrophic factor in old age impairs regulation of synaptic plasticity and neurogenesis in the adult brain. In relation to dopamine, physiological levels of dopamine and dopamine (D2) receptors have been identified in neurons of the medial vestibular nucleus and the lateral vestibular nuclei (which modulate vestibular system directly or indirectly by modulation of GABAergic transmission [9]. Long-term potentiation (LTP), a long-lasting increase in synaptic transmission mainly by ACh is the key factor in learning and memory. Vestibular stimulation not only improves ACh release but by inhibiting the AChE level in hippocampus, this natural therapy increases both the level and duration of action of Acetylcholine [10-12]. Controlled vestibular stimulation do inhibit both the stress axis hypothalamopitutary-adrenal (HPA) axis and sympathetic adrenomedullary axis and thereby reduces the cortisol levels. As high stress impairs cognition, inhibition of HPA and SAM axis by vestibular stimulation brings a stress free condition which modulates learning and memory. The increased GABA transmission in the ipsilesional substantia nigra followed by Stochastic Vestibular stimulation also had an enhancing effect on locomotion in hemiparkinson rat model. Increased concentration of glutamate followed by GVS is observed in ascending pathways of the parabrachial nuclei and solitary tract. Hence several factors contribute to the beneficial effects of vestibular stimulation in improving cognition and motor skills, relieving stress, improving depression, anxiety and promote sleep [13-15].

Conclusion

There was a significant decrease in the depression, anxiety and stress followed by the exercises. Further studies are recommended in this area to recommend vestibular stimulation for the benefit of elderly in general.

References

1. Deliens T, Clarys P, De Bourdeaudhuij I, Deforche B (2014) Determinants of eating behaviour in university students: a qualitative study using focus group discussions. BMC Public Health 14: 53.

2. Deroualle D, Lopez C (2014) Towards a vestibular contribution to social cognition. Front Integr Neurosci 8: 16.

3. Devi NP, Mukkadan JK (2016) Impact of rotatory vestibular stimulation and curcuma longa on spatial learning and memory in wistar albino rats. Asian J Pharm Clin Res 9(2): 167-173.

4. Winter L (2012) Vestibular stimulation on a motion-simulator impacts on mood states. Frontiers Psychology 3: 499.

5. Kumar Sai Sailesh, Archana R, Mukkadan JK (2015) Vestibular stimulation: A simple but effective intervention in diabetes care. Journal Natural Science Biology Medicine 6(2): 321-323.

6. Devi RS, Sivaprakash RM, Namasivayam A (2004) Rat hippocampus and primary immune response. Indian J Physiol Pharmacol 48(3): 329-336.

7. Dibona GF (200) Neural control of the kidney: functionally specific renal sympathetic nerve fibers. Am J Physiol Regul Integr Comp Physiol 279(5): R1517-1524.

8. Ebbeskog B, Ekman SL (2001) Elderly persons' experiences of living with venous leg ulcer: living in a dialectal relationship between freedom and imprisonment. Scand J Caring Sci 15(3): 235-243.

9. Edwards SJ, Yuen K (2010) Heart rate response to vestibular stimulation in two children with Down's syndrome: A pilot study. Aust Occup Ther J 43(3-4): 167-171.

10. Ekpenyong CE, Daniel NE, Aribo EO (2013) Associations between Academic Stressors, Reaction to Stress, Coping Strategies and Musculoskeletal Disorders among College Students. Ethiop J Health Sci 23(2): 98-112.

11. Ekstrom AD, Kahana MJ, Caplan JB, Fields TA, Isham EA, et al. (2003) Cellular networks underlying human spatial navigation. Nature 425(6954): 184-188.

12. Kumar SS, Archana R, Mukkandan JK (2015) Controlled vestibular stimulation: physiological intervention in diabetes care. Asian J Pharm Clin Res 8(4): 315-318.

13. Kurebayashi LFS, Turrini RNT, de Souza TPB, Takiguchi RS, Kuba G, et al. (2016) Massage and Reiki used to reduce stress and anxiety: Randomized Clinical Trial. Rev Lat Am Enfermagem 24: e2834.

14. Kutty B, Sulekha S, Sasidharan A (2014) Current understanding on the neurobiology of sleep and wakefulness. Int J Clin Exp Physiol 1(1): 3-9.

15. Kyrou I, Tsigos C (2007) Stress mechanisms and metabolic complications. Horm Metab Res 39(6): 430-438.