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## **Effectiveness of 8 weeks of vestibular exercise on sleep and autonomic parameters in patients with type 2 diabetes**

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**Abstract**---Management of sleep and autonomic parameters are prime importance in diabetic patients. The present study was undertaken to observe the effectiveness of 8 weeks of vestibular exercise on sleep and autonomic parameters in patients with type 2 diabetes. A total of 30 participants were recruited for the study. After recruiting, the participants were randomly assigned to the control and intervention groups with a 1:1 distribution. The vestibular exercises comprise three sets of exercises of 45 minutes duration each session. Four sessions

per week were administered to the participants. The exercises were standardized by earlier researchers. The same was adopted in the present study. There was a significant decrease in the ISI scores and decrease in the systolic, diastolic and pulse rate in the participants. The present study results show that practicing vestibular exercises along with the prescribed treatment helps to improve sleep and regulate autonomic functions. The study recommends long-term studies with a higher sample size for a better understanding of the vestibular exercises and also recommends adopting these exercises in the treatment protocol.

**Keywords**--Vestibular exercise, Diabetes, sleep, blood pressure, pulse

## **Introduction**

Sleep disturbances are more common in the patients with diabetes. This leads to increase the consumption of the sleep medications and also associated with day time sleepiness [1]. Several reasons were reported for these sleep problems such as neuropathy of peripheral nerves or due to poly urea or due to the disease itself [2]. Lack of adequate sleep in these individuals leads to development of cognitive decline and depression if untreated [3]. Further, autonomic disturbances are more common in these patients [4]. Vestibular system has enigmatic role in the maintenance of homeostasis. This system is well connected with different brain areas related to the sleep and autonomic regulation [5]. Vestibular stimulation was reported to promote sleep by decreasing the sleep latent period and also offering relaxation effect [5]. Vestibular system inhibits the sympathetic system and simultaneously activates the parasympathetic system. These actions of vestibular system make it possible to use as an adjunctive therapy in the management of sleep and autonomic disturbances in diabetic patients. However, the studies in this are relatively sparse. Hence, the present study was undertaken to observe the effectiveness of 8 weeks of vestibular exercise on sleep and autonomic parameters in patients with type 2 diabetes.

## **Materials and methods**

The present study was an experimental study. The study participants were recruited from the OPD of the general medicine department. Both male and female participants within the age group Of 30-60 years were recruited for the study after obtaining the written informed consent. The participants with severe complications were excluded from the study. A total of 30 participants were recruited for the study. After recruiting, the participants were randomly assigned to the control and intervention groups with a 1:1 distribution. The distribution was performed by the random numbers generated by the software randomizer.org. After recording the baseline values, the participants in the intervention was administered the vestibular exercises for 8 weeks whereas no intervention was administered to the participants in the control group. These exercises were administrated as adjunctive therapy to the participants along with the prescribed treatment.

**Vestibular exercises:** The vestibular exercises comprise three sets of exercises of 45 minutes duration each session. Four sessions per week were administered to the participants [6]. The exercises were standardized by earlier researchers. Same was adapted to the present study.

**Assessment of sleep:** Sleep parameter was assessed using insomnia severity index which is a standard questionnaire [7].

**Assessment of autonomic parameters:** Dr. Morepen BP-09 BP 09 Fully Automatic Bp Monitor was used to assess the blood pressure and pulse rate. Both were recorded from the right hand of the participants.

**Ethical considerations:** The present study protocol was approved by the institutional human ethical committee and informed consent was obtained from all the participants. Confidentiality of data was maintained.

**Statistical analysis:** Data was analyzed using SPSS 20.0 version. A student t-test was used to observe the significance of the difference between the groups. Data were presented as mean and SD. A probability value less than 0.05 was considered significant.

## Results

Table 1 presents the ISI scores, SBP, DBP, and pulse rate before intervention. ISI scores were not significantly different between the control and intervention groups. Systolic blood pressure (SBP) and diastolic blood pressure (DBP) and pulse rate were not significantly different between the control and intervention groups. Table 2 presents the ISI scores, SBP, DBP, and pulse rate after intervention. ISI scores were significantly decreased followed by the intervention. There was a decrease in the SBP, DBP and pulse rate followed by the intervention. However, it was not statistically significant.

**Table 1: ISI scores, SBP, DBP, and pulse rate before intervention**

Parameter	Control (n=15)	Intervention (n=15)	P value
ISI score	18±1.03	16±0.77	0.1326
SBP (mmHg)	130±11.36	134±13.43	0.8217
DBP (mmHg)	92±5.42	88±6.20	0.6309
Pulse rate (beats/min)	94±8.26	88±6.71	0.5775

Data were presented as mean and SEM. \*P<0.05 is significant

**Table 2: ISI scores, SBP, DBP, and pulse rate after intervention**

Parameter	Control (n=15)	Intervention (n=15)	P value
ISI score	17±0.77	12±0.52	<0.0001***
SBP (mmHg)	128±9.30	124±9.81	0.7694
DBP (mmHg)	84±4.65	80±5.16	0.5694
Pulse rate (beats/min)	88±7.75	78±4.65	0.2777

Data were presented as mean and SEM. \*\*\*P<0.001 is significant. \*\*P<0.01 is significant. \*P<0.05 is significant.

## Discussion

The present study was undertaken to observe the effectiveness of 8 weeks of vestibular exercise on sleep and autonomic parameters in patients with type 2 diabetes. ISI scores were not significantly different between the control and intervention groups. Systolic blood pressure (SBP) and diastolic blood pressure (DBP) and pulse rate were not significantly different between the control and intervention groups. ISI scores were significantly decreased followed by the intervention. There was a decrease in the SBP, DBP and pulse rate followed by the intervention. However, it was not statistically significant. The calming effects of vestibular stimulation were well reported [8]. Stimulation of vestibular system reduced the latency of sleep and speeded up the transition of wakefulness to sleep in humans [9]. This concept was supported by other studies also [10, 11]. Earlier studies reported that vestibular stimulation regulates autonomic functions by balancing between the sympathetic and parasympathetic systems [12]. This effect is due to vestibular inhibition of sympathetic nucleus and activation of dorsal motor nucleus of vagus [13]. The present study results are in accordance with earlier studies as there was significant improvement in sleep. Further, there is decrease in the blood pressure and pulse rate.

## Conclusion

The present study results show that practicing vestibular exercises along with the prescribed treatment helps to improve sleep and autonomic functions. The study recommends long-term studies with a higher sample size for a better understanding of the vestibular exercises and also recommends adopting these exercises in the treatment protocol.

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