Optimal vestibular stimulation is required throughout the life for homeostasis.[9-15] Vestibular stimulation by swinging on a swing was reported as an effective method for stress management in college students.[16] Vestibular stimulation inhibits the stress axes and brings to stress less condition; hence, we hypothesized that vestibular stimulation may be beneficial in relieving most of the symptoms of PMS.[17] The present study was undertaken to observe the effectiveness of vestibular stimulation in the management of PMS.

MATERIALS AND METHODS

Research design

The present experimental study was conducted at Department of Physiology, Little Flower Institute of Medical Sciences and Research Centre, Angamaly. In the present study, participants served as self-controls. After recording the baseline values in premenstrual period (7 days before menstruation) of menstrual cycle, vestibular stimulation was administered for 2 months. Postintervention values were recorded in the premenstrual period of the 1st and 2nd month. All the parameters were recorded at 9 am to avoid diurnal changes. The present study was conducted in consultation with the physician of Little Flower Hospital and Research Centre.

Participants, inclusion criteria, exclusion criteria

Twenty female participants of age group 18–30 were recruited in the present study after obtaining, voluntary, written, informed consent.

Inclusion criteria

- Healthy females with PMS (PMS will be screened by using PMS questionnaire)[8,18,19]
- Having regular menstrual cycles from 28 to 34 days
- Willing participants.

Exclusion criteria

- The participants with any physical problem (musculoskeletal), psychiatric illness, or on medication including contraceptives will be excluded from the study
- Unwilling participants.

Vestibular stimulation

Vestibular stimulation was administered by making the participants swing on a swing, according to their comfort, as standardized by previous methods.[20]

Assessment of depression, anxiety, and stress

Depression, anxiety, stress scale-42 was used to assess depression, anxiety, and stress.[21]

Assessment of serum cortisol

Serum cortisol levels were assessed by chemiluminescent microparticle immunoassay ABBOTT method.

Assessment of autonomic parameters

Diamond digital sphygmomanometers (BPDG024) were used to record blood pressure, and pulse rate was recorded by using pulse oximeter (EDAN H100B).[10]

Assessment of pain score

Numerical pain score was used to assess the perception of the pain.[22]

Assessment of cognition

Spatial and verbal memory test and mini mental status examination (MMSE) were used to assess the cognition.[23,24]

Assessment of quality of life

The WHOQOL BREF questionnaire is used to assess the quality of life.[25]

Statistical analysis

Data were analyzed by IBM SPSS Statistics for Windows, IBM Corp. Armonk, NY: Statistical tests used are one-way analysis of variance and Tukey's multiple comparison tests. $P < 0.05$ was considered statistically significant.

Ethical consideration

The present study was approved by the institutional ethical committee of Little Flower Hospital and Research Centre, Angamaly. No; EC/3/2015.

RESULTS

Demographic characteristics are presented in Table 1. Depression and stress scores are significantly decreased after 2 months of intervention ($P < 0.05$) [Figure 1]. Anxiety scores decreased followed by vestibular stimulation. However, it is no statistically significant. Serum cortisol levels significantly decreased after 2 months of intervention ($P < 0.001$) [Figure 1]. WHOQOL BREF-transformed scores were not significantly changed followed by the intervention. However, psychological domain score (T2) and social relationships domain 8 score (T3) were increased followed by intervention [Figure 2]. Systolic blood

Table 1: Demographic characteristics (*n*=20)

Demographic characteristics	Mean±SD
Age (years)	22.1±2.69
Height (cm)	161.3±5.45
Weight (kg)	50.35±7.0
Body mass index (kg/m^2)	19.47±2.74

Values expressed are mean±SD. (SD=Standard deviation)

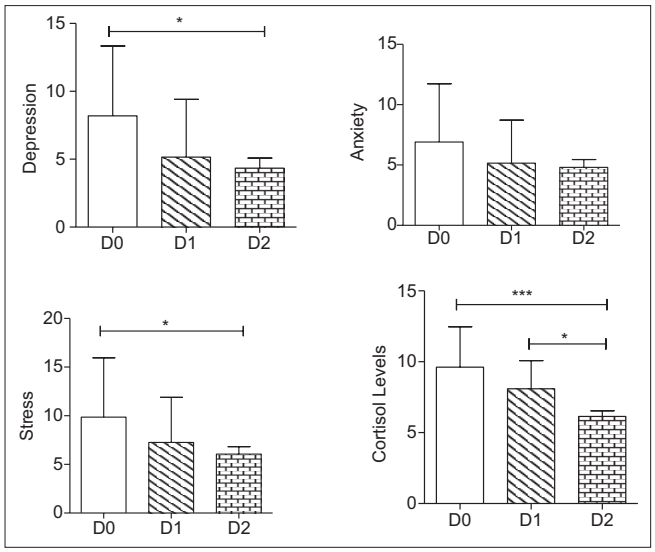

Figure 1: Depression, anxiety, stress scores of participants before and after intervention ($n = 20$) (values expressed are mean ± standard deviation. *$P < 0.05$, **$P < 0.01$, ***$P < 0.001$. D0 - Baseline value in premenstrual period (7 days before menstruation, D1 - postintervention value in premenstrual period (7 days before menstruation), D2 - postintervention values in premenstrual period after 2 months (7 days before menstruation), serum cortisol values are expressed in μg/dL)

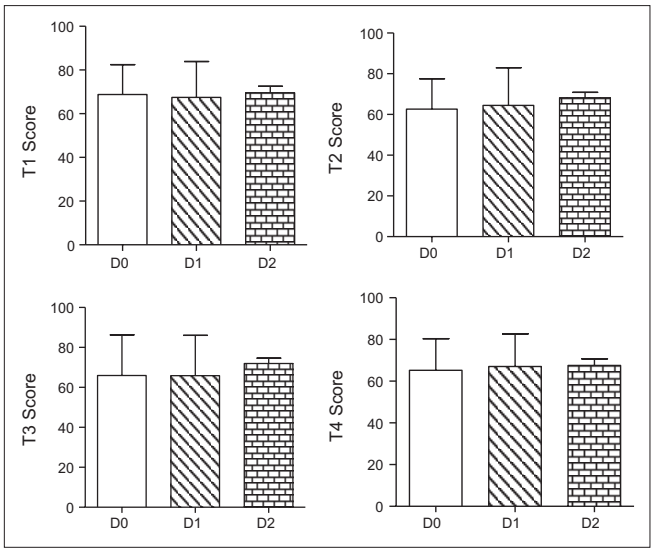

Figure 2: WHOQOL BREF score of participants before and after intervention ($n = 20$) (values expressed are mean ± standard deviation. *$P < 0.05$, **$P < 0.01$, ***$P < 0.001$. D0 - baseline value in premenstrual period (7 days before menstruation, D1 - postintervention value in premenstrual period (7 days before menstruation), D2 - postintervention values in premenstrual period after 2 months (7 days before menstruation)

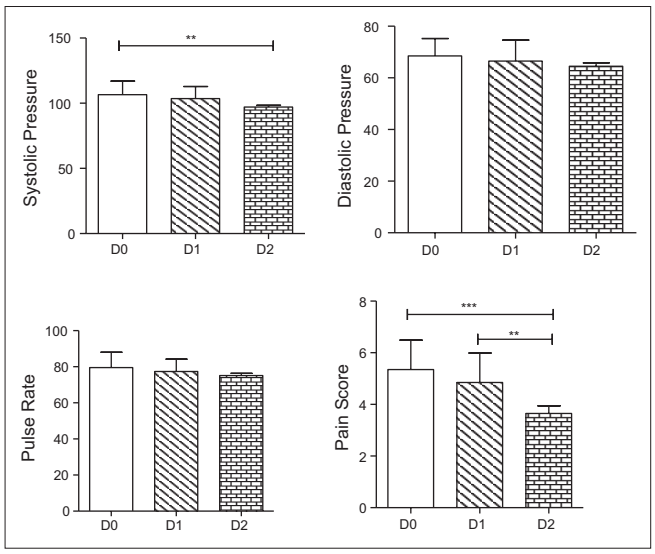

Figure 3: Systolic, diastolic blood pressure, pulse rate, and pain score of the participants before and after intervention expressed in mm of Hg ($n = 20$) (values expressed are mean ± standard deviation. *$P < 0.05$, **$P < 0.01$, ***$P < 0.001$. D0 - baseline value in premenstrual period (7 days before menstruation, D1 - postintervention value in premenstrual period (7 days before menstruation), D2 - postintervention values in premenstrual period after 2 months (7 days before menstruation)

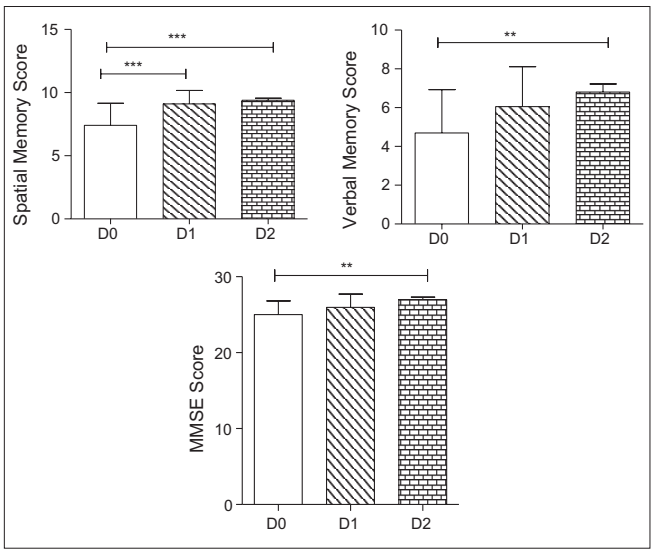

Figure 4: Spatial and verbal memory score, mini mental status examination score of the participants before and after intervention ($n = 20$) (values expressed are mean ± standard deviation. *$P < 0.05$, **$P < 0.01$, ***$P < 0.001$. D0 - preintervention score, D1 - postintervention score after 1 month of vestibular stimulation, D2 - postintervention score after 2 months of vestibular stimulation)

pressure was significantly decreased after 2 months of intervention ($P < 0.01$). No significant change was observed in diastolic pressure and pulse rate [Figure 3]. Pain score was significantly decreased after 2 months of intervention ($P < 0.001$) [Figure 3]. MMSE scores and spatial and verbal memory score were significantly improved followed by intervention [Figure 4].

DISCUSSION

In the present study, conventional swing was used to provide vestibular stimulation. Vestibular stimulation by motion devices is used in ancient times as a treatment for madness.[26,27] However, use of vestibular stimulation as analgesic agent is recent.[28] Vestibular stimulation reduced

the symptoms of pain in migraine patients, amputees, and paraplegics. However, the degree of pain relief varied.[29] Ramachadran *et al.* reported that vestibular stimulation is an effective method of pain relief.[30] Vestibular stimulation may relieve pain by modulating somatosensory perception, through its connections with thalamic nuclei, its connection with raphe nuclei, and its connection with nucleus tractus solitaries.[31] Our study provides further evidence for analgesic effect of vestibular stimulation as we have observed significant decrease in the pain scores followed by vestibular stimulation. It was reported that vestibular stimulation relieves stress by inhibiting stress axes. Animal and human studies have reported decrease in cortisol levels followed by optimal vestibular stimulation.[32-34] Our results are in accordance with earlier studies as we have observed decrease in depression, stress scores as well as serum cortisol followed by vestibular stimulation. Research testified the anatomical connections between vestibular and autonomic nuclei.[35] Vestibular lesions found to cause autonomic abnormalities and optimal vestibular stimulation found to decrease heart rate and blood pressure within normal limits.[36] In the present study, we have observed significant decrease in systolic blood pressure but no significant change in diastolic pressure, which may be due to short duration of intervention.[37] It was reported that vestibular stimulation improves cognition and vestibular lesions cause's defects in memory.[38] We agree with earlier studies as we have observed significant improvement in spatial and verbal memory scores followed by vestibular stimulation. Earlier studies reported marginal increase in all the domains of WHOQOL BREF quality of life.[39] In the present study, psychological domain and social relationship domains showed marginal improvement.

Limitations

We have not maintained control group in this study and the sample size was small.

CONCLUSION

The present study provides preliminary evidence for implementing vestibular stimulation for management of PMS as a nonpharmacological therapy. Hence, we recommend further well-controlled, detailed studies in this area with higher sample size.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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