

*Article***Effect of Moderate Physical Exercise on Autonomic Balance in Irritable Bowel Syndrome**Karma Tenzin<sup>1</sup>, Noorzahan Begum<sup>2</sup>, Sultana Ferdousi<sup>3</sup>**Abstract**

**Background:** Altered autonomic balance has been noted in Irritable bowel syndrome Regular physical exercise may cause restoration of autonomic balance in health and disease. **Objective:** To assess the effect of brisk walking on the autonomic balance by analysis of heart rate variability in patients with Irritable bowel syndrome (IBS). **Methods:** This prospective study was conducted in the Department of Physiology, Bangabandhu Sheikh Mujib Medical University (BSMMU) in 2013. Seventy seven male IBS patients aged 20-50 years, were enrolled from Gastroenterology OPD, BSMMU, Dhaka. Twenty eight healthy sedentary male with similar age were control. HRV measures were recorded once prior to exercise and then after 3 months of brisk walking. For assessing autonomic balance, LF/HF ratio and Max/Min RR was evaluated by Polyrite D machine and software. ANOVA, Independent sample t-test and paired t-test were used for statistical analysis. **Results:** The pre-exercise mean values of LF/HF ratio were significantly higher ( $p < 0.001$ ) in all IBS patients compared to those of control. The post exercise LF/HF ratio were significantly lower ( $p < 0.05$ ) in all IBS patients compared to their pre-exercise values. **Conclusion:** This study concluded that the sympathovagal balance was towards sympathetic predominance in IBS and regular moderate physical exercise may shift the balance towards parasympathetic predominance in them.

**Key words:** Irritable bowel syndrome, sympathovagal balance, Male, Physical exercise, Heart rate variability.

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<http://www.banglajol.info/index.php/JBSP>**Introduction**

**I**BS is an intermittent or continuously occurring chronic functional gastrointestinal disorder that is associated with abdominal pain, bloating and bowel disturbance in the absence of any organic cause<sup>1</sup>.

In accordance with the predominant symptoms present, IBS has been classified as Diarrhoea predominant irritable bowel syndrome (IBS-D), Constipation predominant IBS (IBS-C) and Irritable bowel syndrome alternating type (IBS-A)<sup>2</sup>.

Though pathophysiology of IBS still remains unclear, recent works suggested that it results from a disorder of the brain gut axis, altered visceral sensitivity and altered bowel motility<sup>3</sup>.

There are reports of autonomic dysfunction in IBS characterized by increased sympathetic and decreased parasympathetic activity<sup>4</sup> and also vagal dysfunction in IBS-C and sympathetic dysfunction in IBS-D<sup>2</sup>.

Regular physical exercise has demonstrated improvement in autonomic nerve function in both

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health and in various clinical conditions such as myocardial infarction, rheumatoid arthritis, heart failure, coronary artery disease, type II diabetes mellitus, chronic renal failure, obesity and menopause<sup>5-10</sup>.

Though, several studies reported improvement of autonomic nervous activities under regular physical exercise but few failed to show any significant change.<sup>11-13</sup>

According to task force LF/HF ratio evaluated in power spectral analysis of HRV is an important marker for sympathovagal balance or autonomic balance at any instant.<sup>14-15</sup>.

Tillish et al<sup>16</sup>. and Nayem et al<sup>15</sup> reported higher LF/HF ratio in sedentary IBS than sedentary control whereas lower LF/HF ratio was noted in hypertensive patients after physical exercise.<sup>17</sup>

Lower LF/HF ratio was also noted in physically active subjects compared to sedentary control<sup>5-6</sup>, but few studies failed to present any effect of physical exercise on the LF/HF ratio<sup>18-19</sup>.

Though, shift of sympathovagal balance towards parasympathetic dominance was induced by physical exercise in healthy sedentarys<sup>5-6</sup> but the effect of physical exercise on LF/HF ratio was not studied in sedentary IBS patients.

Therefore, this study has been designed to evaluate the effect of moderate physical exercise by brisk walk on the autonomic balance in patients with IBS.

### Methods

This prospective interventional study was conducted in the Department of Physiology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka from January to December 2013. The protocol of this study was approved by Institutional Review Board of Bangabandhu Sheikh Mujib Medical University. For this purpose, 77 male patients aged 20-50 years with Irritable bowel syndrome were enrolled for the study by random sampling from Gastroenterology OPD, BSMMU. 28 male healthy

controls with similar age and BMI were recruited through personal contact.

According to the predominant symptom present, all IBS patients were divided into 3 subgroups, these included 24 diarrhea predominant IBS (IBS-D), 26 constipation predominant IBS (IBS-C) and 27 altered bowel habit type IBS (IBS-A) patients. 28 apparently healthy sedentary male were enrolled as control. History of chronic illnesses such as heart disease, diabetes mellitus, hypertension, chronic renal failure, thyroid disorders and smoking were excluded and also history of regular physical exercise were ruled out in all selected subjects.

Informed written consent was obtained from all the study participants. Subsequently, a detail family and medical histories and also physical activity status were recorded.

For HRV recording, the subjects were prepared from one day prior to the test. They were advised to take their meal by 9:00 p.m and have sound sleep and avoid any physical or mental stress, and also sedative medications. In addition, they were advised to take light breakfast in the morning without tea and coffee.

All the examinations were done in the Autonomic Nerve Function Test Laboratory in the Department of Physiology, BSMMU. For the purpose of HRV recording, the subject was given bed rest for 15-20 minutes, after which 5 minutes ECG recording was carried out for HRV by polyrite D machine.

On completion of baseline HRV recording, the patients performed brisk walking for 3 months. For this purpose, patients were trained on how to perform brisk walking at a rate of 130 steps per minute for 30 to 45 minutes, for 3 to 5 days in a week for a period of 3 months duration<sup>1,20-21</sup>. However, this exercise intervention was not applied to the control group.

The LF/HF ratio represents the sympathovagal balance and max/min RR represent variability.



## Discussion

Results of this prospective study showed the changes in autonomic balance in IBS patients and reversal of this altered balance brought about by moderate physical exercise for 3 months causing shifting of sympathovagal balance from sympathetic predominance to parasympathetic predominance and decrease the symptoms in patients with irritable bowel syndrome.

In this study pre-exercise LF/HF ratio were significantly higher in all IBS patients and these altered baseline LF/HF ratio indicate change of autonomic balance towards sympathetic dominance in all IBS patients<sup>15,16,22</sup>.

The significant increase in post exercise values of these parameters are consistent with other studies conducted to observe the effect of physical activity on LF/HF ratio but in healthy subjects<sup>5-6, 17</sup>. It is also notable that these parameters are not significantly different among the subtypes irrespective of pre or post exercise.

It is obvious from the results of this study that moderate physical exercise caused shifting of the sympathovagal balance in IBS patients towards more parasympathetic predominance which was previously sympathetic dominance before exercise, supported by significant fall of LF/HF ratio in post exercise period. This is consistent with various investigators who proposed that moderate physical exercise is associated with either increased vagal tone or decreased sympathetic modulation of heart rate in both healthy and diseased conditions<sup>5-6,17</sup>.

Physical exercise reduces the stress by influencing brain plasticity<sup>1</sup> which results in higher parasympathetic activity and improvement in cardiovascular baroreflex sensitivity. In addition, both acetylcholine and choline-acetyl transferase content in cardiac tissue may be increased, thereby parasympathetic nervous activity<sup>6</sup>. Moreover, physical exercise also might promote adjustments in cardiovascular control sites via either neural remodeling or endogenous factors like nitric oxide and angiotensin II. It has been

suggested that these adaptations might cause decrease in sympathetic and increase in vagal component in cardiac control to improve cardiac autonomic balance<sup>23-25</sup>. The lack of discrimination of exercise induce change in autonomic balance among different sub type of IBS patients suggests symptoms based characteristics are independent of autonomic modulation.

## Conclusion

This study concludes that male patients with all the three subgroups of IBS had noticeable sympathovagal balance with sympathetic predominance, however moderate physical exercise could shift the balance towards parasympathetic dominance by increasing cardiac parasympathetic activity and decreasing the cardiac sympathetic activity.

**Conflict of Interest:** None

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