



EFFECT OF YOGA TRAINING ON TIME DOMAIN PARAMETERS OF HEART RATE VARIABILITY IN INFLAMMATORY BOWEL DISEASE PATIENTS: A RANDOMIZED CONTROLLED INTERVENTIONAL STUDY

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ABSTRACT

Background: Inflammatory Bowel Disease (IBD) occurs by an incorporation of multiple factors; is a group of intestinal disorders that leads long time inflammation of the digestive tract and is usually associated with extra-intestinal manifestations of illness. **Aims and Objectives:** Comparative study to check the effect of yoga interventions on heart rate variability in inflammatory bowel disease patients. **Materials and Methods:** Data for the present study were collected from inflammatory bowel disease patients in the age range of 20-40 years of both genders attending OPD of Gastroenterology department S.M.S. Medical College and Hospital; Jaipur with a diagnosis of IBD selected. An equal number of IBD patients from OPD of the Gastroenterology Department had considered as the control they did not undergone any yoga intervention. **Results:** There is significant increase in pnn-50 ($P < 0.05$) at 6th week of yoga intervention and significantly increase in SDNN, RMSSD & PNN-50 ($p < 0.05$) parameters of time domain Heart rate variability at 12th week of yoga intervention. **Conclusion:** Our study results show that yoga may be beneficial in IBD patients to improve time domain parameters of heart rate variability and overall health of IBD patients.

KEYWORDS :**INTRODUCTION:**

The first case of IBD discovered in the late 1700s, it resembled UC. In 1859, the term "ulcerative colitis" was first coined (Yue Shan et al 2021). Later in 1932, searched CD was different from UC due to its transmural and patchy pattern of inflammation CD can involve any part of the gastrointestinal tract while UC is restricted to the colon. [1]

Worldwide the incidence of IBD is about 0.5-23/1, 00,000 among these 0.1 to 13.9/100000 for CD and 0.3 to 15/100000 for UC. [2]

More than 2 million European and 1.5 million North American populations are get affected by inflammatory bowel disease (IBD).[5] (Seyed SS et al 2019). Since the first reported case of IBD in 1956, In China more than 2.6 lakh people living with IBD and more than 6.8 million people are getting affected by IBD in the world.

The pathophysiology of IBD is multifactorial, involving a complex interplay between genetic predisposition, gut microbiota, gut mucosal integrity, the immune system, and environmental triggers such as nutrition and psychosocial stressors. [6]

IBD divided mainly in two types Crohn's disease (CD) and ulcerative colitis (UC). UC is limited to the large intestines and the rectum, specifically the mucosa and superficial submucosa; Crohn's disease is transmural and involve any part of the gastrointestinal tract. HRV assesses the differences in the periods between beat to beat, which vary under autonomic control. The heart rate variability test has two components, the time domain analysis, and the frequency domain analysis. In frequency, domain analysis HF component contributes to parasympathetic influences, and the LF component contributes to both parasympathetic (PNS) and sympathetic nervous system (SNS) activity.

Heart rate variability is a useful tool for the evaluation of early sympathetic-parasympathetic imbalance in the autonomic nervous system. Low variability in heart rate implies a decreased ability to maintain internal homeostasis. Generally sympathetic system activation increases heart rate while parasympathetic slows the heart rate. (European Task Force, 1996).

Looking to the extent of health hazards in inflammatory bowel disease and the increasing trend of westernized life style in community. The present study was undertaken to find out changes in heart rate variability before and after yoga intervention in inflammatory bowel disease patients, in the S. M. S. Medical College and Attached Hospitals, Jaipur.

MATERIALS & METHODS: Our aim to study the effect of yoga interventions on autonomic function and stress level in inflammatory bowel disease patients. Data for the present study were collected from inflammatory bowel disease patients in the age range of 20-40 years of

both genders attending OPD of Gastroenterology department S.M.S. Medical College and Hospital; Jaipur with a diagnosis of IBD selected. An equal number of IBD patients from OPD of the Gastroenterology Department had considered as the control they did not undergone any yoga intervention. The Research Review Board and Ethical Committee of the Institute obtained permission.

The criteria for inclusion and exclusion of participants were as follows:

INCLUSION CRITERIA FOR IBD (CASE AND CONTROL) GROUP:

- (1) Follow-up IBD patients from OPD (Both UC and Crohn's disease)
- (2) Aged 20- 40 years
- (3) Subjects giving informed written consent.

EXCLUSION CRITERIA FOR BOTH GROUPS:

- (1) Any acute illness affecting ANS functions
- (2) Hypertension, Cardiac, Diabetics, Renal, Liver & other chronic diseases
- (3) Subjects on medications known to affect autonomic functions.
- (4) Subjects who are not cooperative.

RANDOMIZATION:

After taking informed consent from subjects, they randomized into two groups by an alternate allocation method, assigned a number to each subject as they arrived at the first session (baseline visit). Each subject was designated a number (1, 2, 3, etc.) in the order of his or her arrival. Those subjects with odd numbers enrolled to the study group; those with even numbers enrolled to the control group.

In our study first patient allocated by chit box method. Odd numbers allocated to yoga group and even numbers as non-yoga control group. Patients had divided randomly into the case group or control group. The case group underwent a 12-week yoga intervention (physical postures, pranayama, and meditation) 50 min/day in addition to standard medical therapy, and the control group with standard medical therapy alone. Initially trained case group for yoga at S.M.S Medical College Yoga OPD than follow online. Yoga performed under 3 activities

- Asana
- Pranayama
- Meditation

STATISTICAL ANALYSIS: SDNN, RMSSD & PNN-50 presented as mean $\pm$ standard deviation (SD). Pre- and post-training data analyzed by an unpaired t-test & Mann -Whitney rank sum test. A value of $P < 0.05$ considered to have statistical significance.

RESULT: In control group at baseline, the sdnn (ms) was 47.02 $\pm$ 45.60, rmssd (ms) was 43.97 $\pm$ 53.93 and Pnn-50 (%) was 14.07

± 21.92 . After 6th week of yoga intervention sdn increased 62.38 ± 54.09 , rmssd increased 60.73 ± 60.84 & pnn-50 20.66 ± 24.20 also and they improved more at 12th week of yoga intervention as sdn 77.22 ± 73.05 , rmssd 84.42 ± 92.62 , pnn-50 24.23 ± 26.37 . There is significant increase in pnn-50 ($p < 0.05$) at 6th week and at 12th week found significant increase in Sdn, rmssd, pnn-50 ($p < 0.05$). In compare to non- interventional control group there is significant improvement in yoga intervention group. Our study results showed significant improvement in time domain heart rate variability on IBD yoga intervention group.

Table-1: Comparison of Heart rate variability (HRV) parameters between control group and yoga intervention group at baseline

HRV Parameters	Control Group (Mean $\pm$ SD)	Yoga Group (Mean $\pm$ SD)	P-value
SDNN (in ms)	47.02 $\pm$ 45.60	39.58 $\pm$ 17.74	0.339*
RMSSD (in ms)	43.97 $\pm$ 53.93	31.32 $\pm$ 22.26	0.174*
PNN-50 (in %)	14.07 $\pm$ 21.92	8.94 $\pm$ 14.56	0.799#

*Unpaired t test, #Mann-Whitney Rank Sum test

Table-2: Comparison of Heart rate variability parameters between control group and yoga intervention group at 6th week

HRV Parameters	Control Group (Mean $\pm$ SD)	Yoga Group (Mean $\pm$ SD)	P-value
SDNN (in ms)	47.02 $\pm$ 45.60	62.38 $\pm$ 54.09	0.174*
RMSSD (in ms)	43.97 $\pm$ 53.93	60.73 $\pm$ 60.84	0.196*
PNN-50 (in %)	14.07 $\pm$ 21.92	20.66 $\pm$ 24.10	0.045#

Unpaired t test, #Mann-Whitney Rank Sum test, $P < 0.05$ show significance

Table-3: Comparison of Heart rate variability parameters between control group and yoga intervention group at 12th week

HRV Parameters	Control Group (Mean $\pm$ SD)	Yoga Group (Mean $\pm$ SD)	P-value
SDNN (in ms)	47.02 $\pm$ 45.60	77.22 $\pm$ 73.05	0.029*
RMSSD (in ms)	43.97 $\pm$ 53.93	84.42 $\pm$ 92.62	0.019*
PNN-50 (in %)	14.07 $\pm$ 21.92	24.23 $\pm$ 26.37	0.017#

*Unpaired t test, #Mann-Whitney Rank Sum test, $P < 0.05$ show significance

DISCUSSION:

On comparison of non-yoga group to yoga intervention group significant changes in standard deviation of all R-R intervals (sdnn), Square root of the mean of the sum of the squares of differences between successive NN intervals(rmssd) & NN50 count divided by the total number of all R-R intervals(pnn-50) found at 12th week of yoga. Changes in variables show significant role of yoga in time domain HRV parameters at the 12th week of yoga. There is no significance found at baseline & 6th week.

Autonomic function assessed non-invasively by the help of autonomic function test battery (Ewing's battery) and HRV test. HRV mainly reflected the equilibrium relationship between the vagus nervous system and sympathetic nervous system, and the reduce tension of vagus nerve was used as a marker of autonomic neurofunctional disorders.

Similar results show the effect of yoga on time domain HRV, Helen Aghdasi-Bornaun et al (3) statistically found significant differences in time domain indexes of HRV, between yoga group and non-yoga control group. Bei-Bei Wang et al (4) said HRV parameters in CD group was faster, compared to control group Abhimanyu Ganguly et al (5) could not found a significant effect on HRV parameters while we found significant effect of yoga on HRV parameters.

In present study show significant effect of yoga on autonomic function and time domain HRV parameters

CONCLUSION:

The study result shows that HRV is a useful indicator of cardiac autonomic function test. Controlled, slow, deep breathing and various yoga asana functionally readjust the autonomic nervous system by stretch-induced inhibitory signals and hyperpolarization currents propagated through both neural and non-neural tissue, which

synchronizes neural segments in the heart, lungs, limbic system, and cortex IBD group usually have more tendency for parasympathetic suppression and sympathetic predominance, which reflects an autonomic dysfunction. Regular practices of yoga asana, pranayama and meditation for 50 minutes daily has shown improvement in HRV. According our study yoga may be helpful in improving the overall health and stress of IBD individuals.

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