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Combined Effect of Yoga and Dietary Modification in Heart Failure with Preserved Ejection Fraction Patient - A Case Report

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ABSTRACT:

Most elderly individuals who experience heart failure (HF), especially older women, have a preserved left ventricular ejection fraction. Heart failure with preserved ejection fraction (HFpEF) is increasing in prevalence with the aging of the population. This is a case of an 82-year-old; married woman, diagnosed with HFpEF [CAG – Triple vessel disease (TVD)]. The physician advised her to undergo conventional medication and pacemaker implantation. She was hospitalized for 6 days, after discharge she was suggested to practice the yoga module (Table 1) and dietary modification (Table 2) along with conventional medication. After 8 weeks of intervention the patient's Submaximal Functional Capacity, Quality of Life (QoL) improved and vitals such as Heart rate (HR), Respiratory rate (RR), and Blood pressure (BP) also helped in maintaining normal blood sugar levels. This case report intends to highlight the combined benefits of yoga with dietary modification in an HFpEF patient to improve their cardiac function and overall QoL.

KEYWORDS: Geriatric Syndrome, Heart Failure, Pranayama, Preserved Ejection Fraction, Quality of Life.

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INTRODUCTION:

Most elderly individuals who experience heart failure (HF), especially older women, have a preserved left ventricular ejection fraction.[1] HFpEF accounts for almost half of all community-occurring instances of heart failure in people over 65. In the highest age decile, (≥90 years old), nearly all patients with HF have preserved EF. High rates of morbidity and mortality are linked to HFpEF. [2] After HF hospitalization, the 5-year survival is a dismal 35%, worse than

many cancers. When the number of comorbidities in HFpEF patients rises, so does their risk of mortality. Even after adjustment for comorbid conditions, mortality rates associated with HFpEF are higher than in general population age-matched controls. Similar to patients with HF with reduced EF (HFrEF), people with HFpEF also have significant rates of readmission. In patients hospitalized with HFpEF, 20% are readmitted within 30 days of hospital discharge and >50% within 1 year. Along with similarly decreased levels of physical activity as those seen in patients, the quality of life in HFpEF is as bad as or worse than that of HFrEF with moderate-to-severe chronic obstructive pulmonary disease (COPD). HF in common is widely recognized as a lifestyle disease and evidence suggests that lifestyle changes particularly dietary modification, physical activity, stress management, meditation, and yogic breathing techniques decrease heart attacks. Here is a case report on the effect of yoga and dietary modification in a patient with TVD and HFpEF.

CASE DESCRIPTION:

An 82-year-old woman with a 5-day history of progressive shortness of breath within 4-5 steps of walking, also in supine rest and on exertion with fatigue which gradually worsened and interfered with daily activities. She denied exertional chest pain. On presentation, she was in severe Bradycardia with an HR of 42 beats per minute (bpm). Her baseline electrocardiogram (ECG) showed Right Bundle Branch Block (RBBB), basal 2:1 atrioventricular (AV) block, left ventricle (LV) normal, no regional wall motion abnormality (RWMA), LVEF was 85% and suspected to have Sick Sinus syndrome (SSS). For further treatment, she was directed to a cardiologist. Her medical history was significant for type 2 diabetes mellitus on T. Glycomet GP2 (2/500) orally twice/day for the past 4 years before admission.

On examination, her BP was 210/50 mm Hg and bradycardia with HR dropped to 36bpm. Respiratory examination revealed decreased breath sounds and bibasilar crackles. Her laboratory results revealed N-Terminal Pro–B-Type Natriuretic Peptide (NT-pro BNP) 2653pg/mL (normally <450pg/mL), glycosylated hemoglobin (A1C) of 8.3% (less than 7%), and troponin-T of 0.021lg/L (normally 0 - 0.01ng/mL). On an emergency basis Temporary – Transvenous pacemaker implantation (TPI) was done on 27th Jan, 2024. 2D-ECHO showed bradycardia with overall good LV/RV systolic function, no definite RWMQ, moderate eccentric MR, myxomatous mitral leaflet, SAVD: Mild AR, No significant AS., Moderate TR, Mild pulmonary hypertension. ECG status post TPI showed 2:1 AV block with bradycardia. CAG was done under aseptic condition and the report shows that left main coronary artery (LMCA) was normal, proximal left anterior descending artery (LAD) stenosis 80% type 3 vessel, first diagonal artery (D1) proximal 40 – 50% stenosis, second diagonal artery (D2) mid portion of lower branch 80% stenosis, left circumflex branch (LCX) proximal 80% stenosis, obtuse marginal branch 2 (OM2) proximal 70% stenosis, right coronary artery (RCA) proximal 80% stenosis and precrux 90% stenosis with impression CAD – TVD.

As per the advice and treatment plan of physician, permanent DDDR pacemaker implantation (PPI) was done. The post-procedure was uneventful with normal sinus rhythm achieved and patient was in ICU stay for observation. The patient was advised for coronary revascularization and

she was discharged in stable condition with medications optimized and with the following medical advice not to stop medications without consulting physician, to maintain a low-fat diet, to avoid heavy work, and to review after 10 days for wound inspection. During physician review – on inspection wound was clean and so the sutures were removed.

Post-discharge, along with conventional medications [Atorvastatin (20mg), Aspirin (75mg), Glimepiride (2mg), Metformin (500mg), Amlodipine (5mg), Isosorbide mononitrate (25mg), Tramadol (18.75mg) for 5 days, Paracetamol (162.5mg) for 5 days, Sodium picosulfate (10mg) in case of emergency, Spironolactone (25mg), Torasemide (10mg), Ciprofloxacin (500mg) for 7 days], the dietary modifications were advised and to practice specific yogic breathing, mudra and relaxation techniques daily.

INTERVENTION:

The intervention was given for 8 weeks, 2 weeks (daily observation), 3 weeks (twice/week), and 3 weeks (once/week) and the patient was observed by the caretaker daily for any discomforts. The elaborated daily plan of yogic intervention and dietary modification is mentioned in Table 1 and Table 2.

Outcome Measures:

Primary – Submaximal Functional Capacity, QoL (Table 3 and 4)

Secondary – Blood pressure, Heart rate, Respiratory rate, Blood glucose.

Apart from QoL, all the outcomes are measured once every 2 weeks (i.e., the first day of 2nd, 4th, 6th & 8th week) of which pre-intervention data is kept as baseline. (Table-6)

6MWT Formula and Normal Range

The normal range of 6MWD for our patient is calculated with the following formula: [3]

6MWD = 218 + (5.14 * height in cm – 5.32 * age in years) – (1.8 * weight in kg) + (51.31 * gender)

The range of healthy individuals in 6MWD is 400 to 700m [4]

Details of the patient were height 154cms, 82 years of age, weight 68kgs, and gender was factored into the equation by male=1, female=0.

Also, the patient's perceived exertion is measured using the BORG Scale. (Table 5)

On calculation, the normal range of 6MWD for our patient is 450.92m.

Table-1: Yogic Intervention

YOGA MODULE			
Therapy	**Specific Practice**	**Duration Per Session**	**Frequency (No. Of Sessions Per Day)**
Pranayama	Conscious Breathing	20 minutes	2
	Alternate Nostril Breathing	10 minutes	2
Mudra	V-Mudra [9]	15 minutes	2
Relaxation	Corpse pose	15 minutes	2

Table-2: Dietary Intervention:

DIET THERAPY			
Timings	**Food Items**	**Quantity**	**Serving/Day**
7.00 AM	Juice: Curry leaves/ Lemon/ Orange/Wheatgrass/ Ash gourd/ Lemon with mint/ mint with coriander leaves/ Plantain pith/Carrot/ Beetroot.	200 ml	1
9.00 AM	Vegetable salad made by a mixer of 2 or 3: carrot/ beetroot/ snake gourd/ bottle gourd/ ivy gourd/groundnut/ cabbage/ capsicum/ onion/ tomato.	120 g	1
	Fruit salad made by a mixer of 2 or 3: pineapple/ papaya/ muskmelon/ orange/ mosambi/ watermelon/ pomegranate/ gooseberry.	180 g	1
12.15 PM	Juice: Curry Leave/ Lemon/ Orange/Wheatgrass/ Ash gourd/Lemon with mint/ Plantain pith/ Carrot/ Beetroot.	200 ml	1
2.00 PM	Vegetable salad made by a mixer of 2 or 3: carrot/ beetroot/snake gourd/ bottle gourd/ ivy gourd/ groundnut/ capsicum/ onion/ tomato.	120 g	1
	Fruit salad made by a mixer of 2 or 3: pineapple/ papaya/ muskmelon/ orange/ mosambi/ watermelon/ pomegranate/ gooseberry.	180 g	1
4.00 PM	Ragi milk/ Bottle gourd juice/Amla juice/ Buttermilk/ Lemon/ Cucumber juice/ Carrot juice/ orange juice.	200 ml	1
7.00 PM	Vegetable salad made by a mixer of 2 or 3: carrot/ beetroot/snake gourd/ bottle gourd/ ivy gourd/ groundnut/cabbage/ capsicum/onion/ tomato.	120 g	1
	Fruit salad made by a mixer of 2 or 3: pineapple/ papaya/ muskmelon/ orange/ mosambi/ pomegranate/gooseberry.	180 g	1

Table 3: Minnesota Living with Heart Failure Questionnaire Scores:

Question	Baseline	Post
MLHFQ 1	4	0
MLHFQ 2	3	0
MLHFQ 3	4	2
MLHFQ 4	2	1
MLHFQ 5	3	0
MLHFQ 6	5	1
MLHFQ 7	2	2
MLHFQ 8	0	0
MLHFQ 9	0	0
MLHFQ 10	0	0
MLHFQ 11	3	1
MLHFQ 12	3	1
MLHFQ 13	3	1
MLHFQ 14	2	0
MLHFQ 15	4	3
MLHFQ 16	4	0
MLHFQ 17	4	2
MLHFQ 18	1	0
MLHFQ 19	2	0
MLHFQ 20	5	2
MLHFQ 21	2	0

The MLHFQ has a total score (21 items, score range 0–105), the sum of points of the physical dimension subscale (8 items, score range 0–40), and the sum of points of the emotional dimension subscale (5 items, scores range 0–25). Higher scores indicate worse HRQoL. [10]

Table 4: MLHFQ Dimensional Scores

MLHFQ	PRE	POST
Total	56	16
Physical dimension	22	6
Emotional dimension	14	4

Table 5: BORG Rating Perceived Exertion (RPE) Scale:

Rating	Exertion
0	Not at all
1	Extremely light
2	Very light
3	Moderate
4	Somewhat hard
5, 6	Hard/Heavy
7, 8	Very Hard
9	Extremely Hard
10	Maximal

Table 6: Parameter Outcomes

At the Baseline				
Vitals	**Borg Scale**	**Laps ~ 6MWD**	**Post Borg Scale**	**GRBS**
140/70mm Hg 82bpm 27cpm	2	3 ~ 180m	8	332 mg/dL
At Follow-Up – 1 i.e.,1st day of 2nd week				
140/66mmHg 82bpm 24cpm	1	4 ~ 240m	7	256 mg/dL
At Follow-Up – 2 i.e.,1st day of 4th week				
138/68mmHg 80bpm 22cpm	1	4.67 ~ 280m	6	222 mg/dL
At Follow-Up – 3 i.e.,.1st day of 6th week				
136/70mmHg 82bpm 21cpm	1	5.5 ~ 330m	4	171 mg/dL
At Follow Up – 4 i.e,.1st day of 8th week				
130/70mmHg 80bpm 19cpm	1	6 ~ 360m	3	124 mg/dL

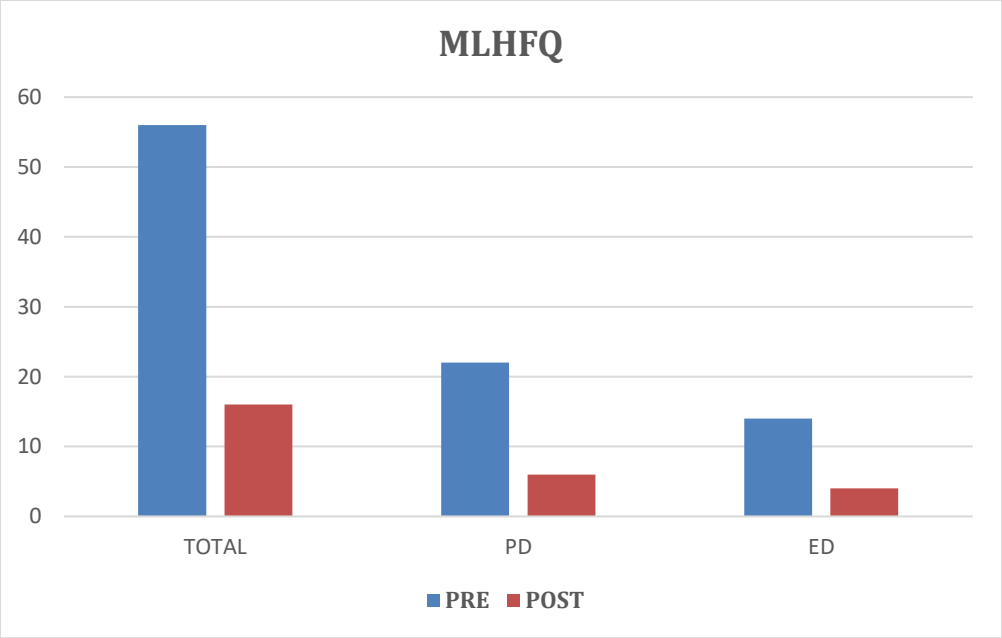

Figure-1: MLHFQ - Minnesota Living with Heart Failure Questionnaire; PD – Physical Domain; ED – Emotional Domain

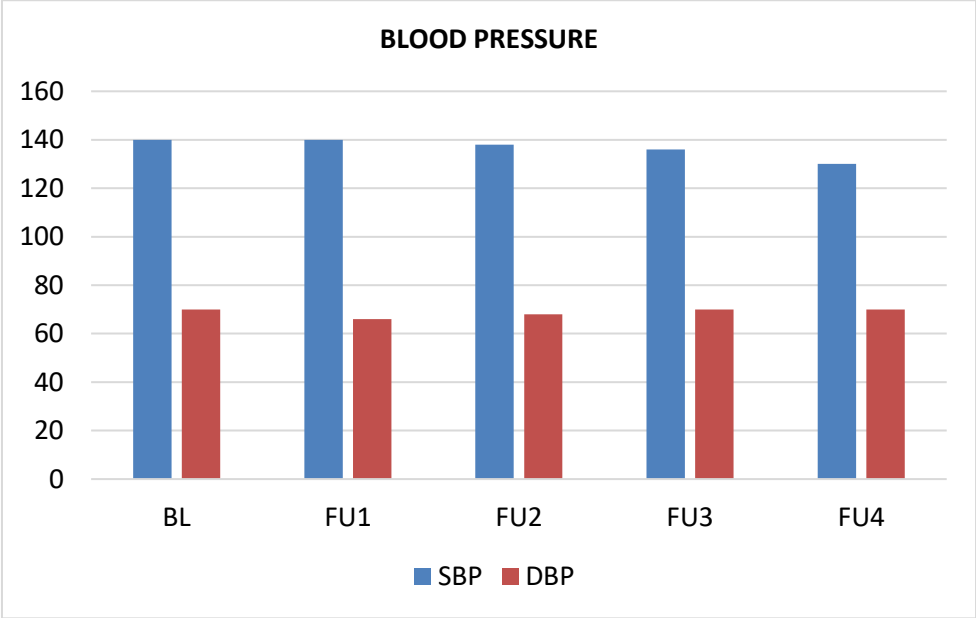

Figure-2: SBP – Systolic Blood Pressure; DBP – Diastolic Blood Pressure; BL – Baseline; FU – Follow Up

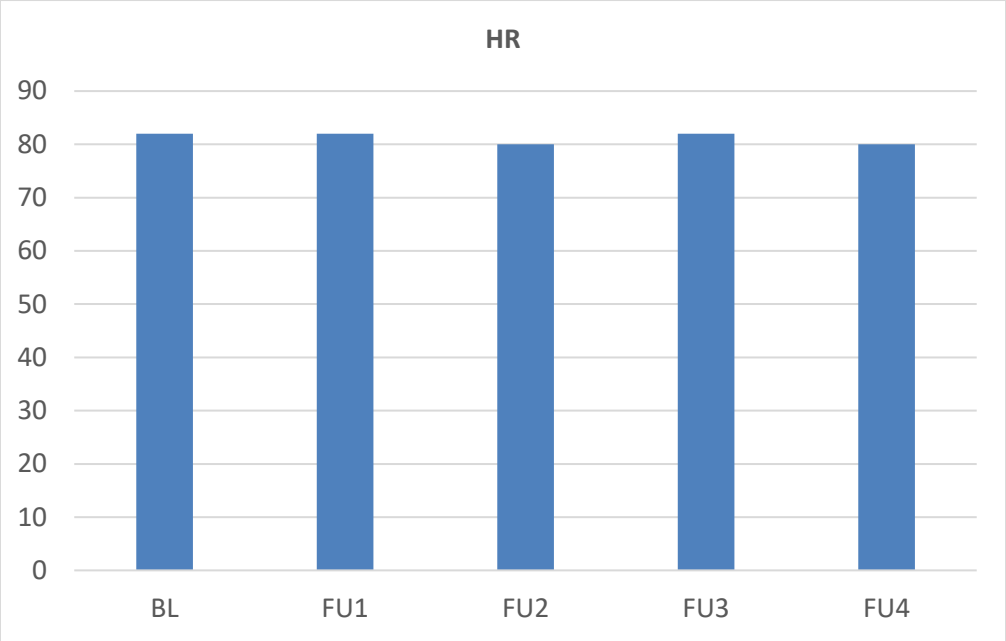

Figure-3: HR – Heart Rate; BL – Baseline; FU – Follow Up

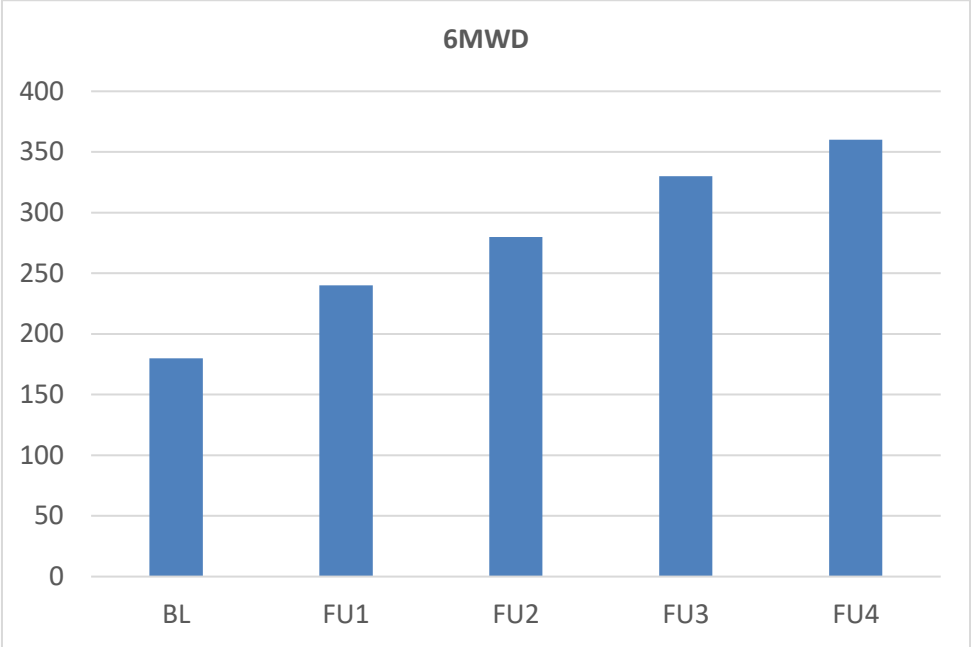

Figure-4: 6MWD – 6 Minute Walk Distance; BL – Baseline; FU – Follow Up

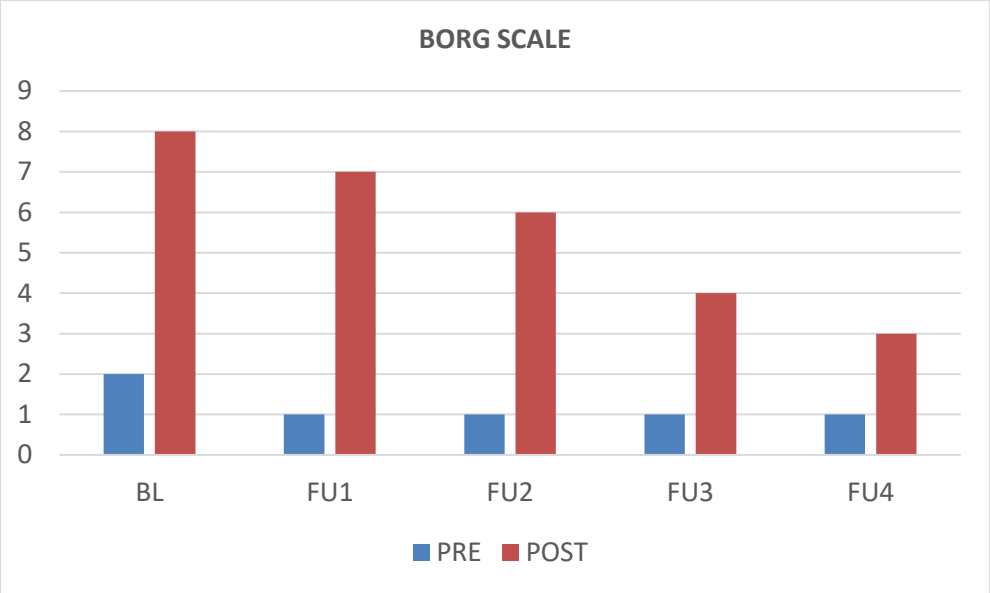

Figure-5: Borg RPE Scale; BL – Baseline; FU – Follow Up

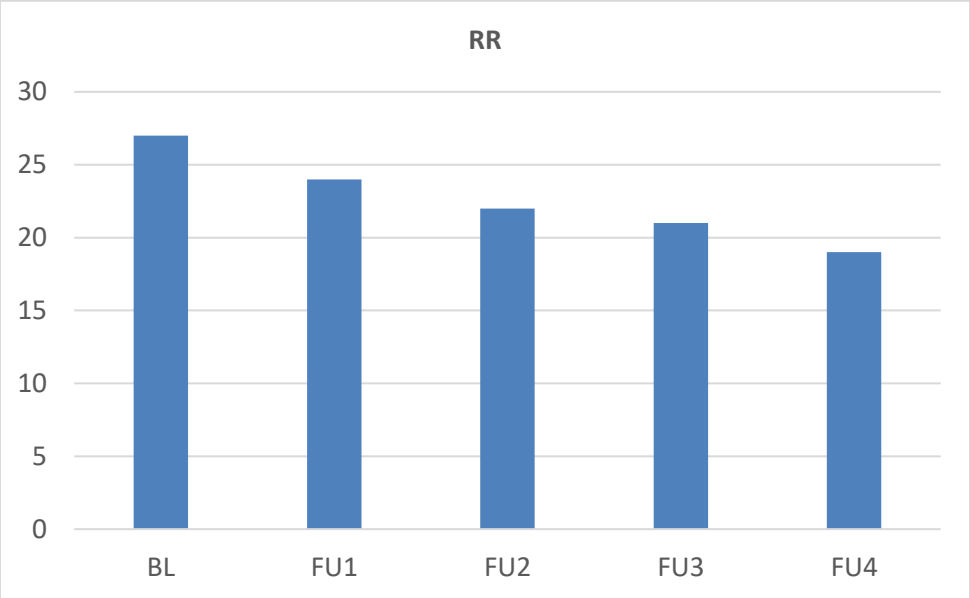

Figure-6: RR – Respiratory Rate; BL – Baseline; FU – Follow Up

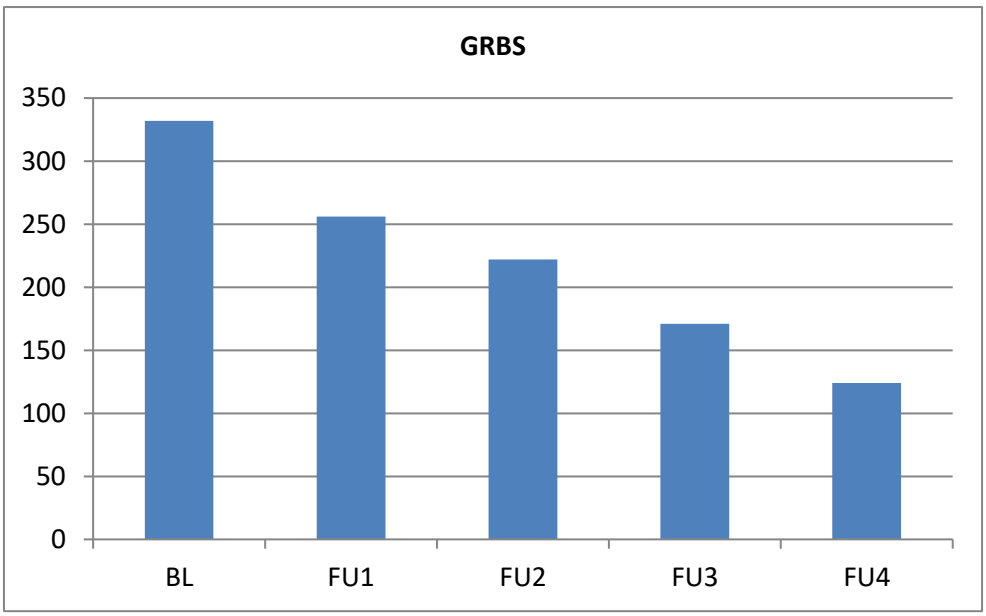

Figure-7: GRBS – General Random Blood Glucose; BL – Baseline; FU – Follow Up

RESULTS:

This evidence suggests an increase in Submaximal functional capacity (Figure-4), notable changes in Perceived Exertion Scale (Figure-5), improvement in vitals like BP(Figure-2), HR (Figure-3), RR (Figure-6), positive changes in blood glucose level (Figure-7), and improved QoL (Figure-1) in this study might be attributed to the combined effect of yoga, diet, and conventional medicines.

DISCUSSION:

Despite having retained systolic function, individuals with HFpEF have low functional capacity, and not much has been done to improve their course of care. Recent studies state patients with peripheral abnormalities, poor functional ability, or restrictive breathing exhibit increased signs of exercise intolerance. To increase exercise tolerance, therapeutic approaches that focus on the interconnected roles of these systems are required. Yoga has always been a challenging physical discipline linked to particular breathing methods. Benefits include improved motor and cognitive function, positive effects on the treatment of hypertension, a reduction in the inflammatory process, and an increased functional capacity of patients with HF and related illnesses. At the moment, it is advised in risk reduction programs and cardiovascular rehabilitation. Few publications exist on the functional and neuromuscular characteristics of HFpEF patients during an acute or adaptive response to physical yoga and/or breathing practices. [5]

Since the 1970s, yoga and meditation have been used in HFpEF as a lifestyle intervention. Research indicates that consistent yoga practice benefits people with HF by improving psychological (such as stress, anxiety, depression, and negative affect) as well as physical (such as BP, HR, RR, and blood sugar levels). [6,7]

The two most important dietary groups that affect HF are fruits and vegetables. A worldwide estimate of 11% of HF deaths is attributable to inadequate intake. While

fruits and vegetables are known to generate antioxidant, anti-inflammatory, and anti-atherosclerotic effects that aid in lowering HF mortality by halting or reversing the process of atherogenesis, oxidative stress, and inflammation play a crucial part in the pathogenesis of HF. [8]

CONCLUSION:

The study investigated the effects of persistent yogic intervention coupled with dietary measures on individuals with HFpEF. Findings revealed a significant enhancement in most of the parameters, suggesting that a holistic approach combining yoga and dietary intervention holds promise in managing HFpEF. However, further large-scale studies are warranted to explore the long-term benefits and optimize therapeutic strategies.

Informed consent:

An informed written consent was obtained from the patient for reporting this case.

Acknowledgment:

Thank the patient for the permission to use her medical history and reports.

Conflict of interest: The author declares that there is no conflict of interest.

Guarantor*:* The corresponding author is the guarantor of this article and its contents.

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