Original Research Article

Cardiac Rehabilitation with Nordic Walking Versus Cardiac Rehabilitation with Brisk Walking in patients on medical management after an Acute Coronary Syndrome – A comparative study

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Abstract

Objective: To examine Heart Rate (HR), Rate of Perceived Exertion (RPE) and Physical fitness (assessed with Fullerton Functional Fitness Test) by giving Cardiac rehabilitation with Nordic Walking and Cardiac rehabilitation with Brisk Walking in patients on medical management after an Acute Coronary Syndrome(ACS).

Materials and methods: Randomized Experimental design was used in this study. 40 ACS patients were randomly allocated into two groups Group A and Group B. Cardiac rehabilitation with Nordic Walking was performed to Group A (n=20) and Cardiac rehabilitation with Brisk Walking was performed to Group B (n=20) for 12 weeks to assess the improvement in HR, RPE and Physical fitness. Physical fitness was assessed using Fullerton Functional Fitness Test carried out before and after the total session of 12 weeks intervention.

Results: Statistical analysis revealed that in within group comparison, Group A showed significant improvement ($p<0.05$) in HR, RPE and Physical fitness whereas Group B showed significant improvement ($p<0.05$) in HR, RPE and 4 components of Fullerton Functional Fitness Test. Comparison between two groups showed that Cardiac rehabilitation with Nordic Walking indicated

statistically significant improvement ($p<0.05$) than that of Cardiac rehabilitation with Brisk walking in HR, RPE and 4 components of Fullerton Functional Fitness Test in ACS patients on medical management.

Conclusion: It was concluded that Cardiac rehabilitation with Nordic Walking is more effective than Cardiac rehabilitation with Brisk Walking in improving HR, RPE and Physical fitness in ACS patients on medical management.

Key words

ACS, Cardiac rehabilitation, Nordic walking, Brisk walking, HR, RPE, Physical fitness.

Introduction

A spectrum of coronary artery diseases including unstable angina, ST-segment elevation myocardial infarction (STEMI), and non-ST-segment elevation myocardial infarction (NSTEMI) are encompassed under Acute coronary syndrome (ACS) [1]. Coronary artery disease (CAD) is a condition where atherosclerotic plaque builds up inside the coronary arteries due to which there is restriction to the blood flow and delivery of oxygen to the heart, this leads to ACS. Partially or intermittently occluded coronary artery causes unstable angina and NSTEMI, where as a fully occluded coronary artery causes STEMI [2].

Millions of individuals are affected each year by ACS which is a potentially life-threatening condition [3]. CAD is the foremost single cause of mortality causing nearly 7 million deaths annually. There is loss of 129 million Disability Adjusted Life Years (DALYs) globally due to CAD annually. Over the last four decades, it is observed that the mortality rate due to CAD has decreased, but still it accounts for almost one third of deaths in individuals older than 35 years of age. Increased sedentary lifestyle, smoking and obesity contribute to the high incidence of CAD [4].

The presenting symptoms and variations in cardiac markers and electrocardiographic findings correlate with the degree to which a coronary artery is occluded. Angina, or chest pain, is the classic symptom of ACS [2]. Substernal pain that occurs on exertion and is relieved with rest is described as Angina [1]. It can occur with or without radiation to the arm, jaw, neck, back, or epigastric area. Shortness of breath, diaphoresis, nausea, and light headedness may also occur in addition to angina. Patients may also present with changes in vital signs, such as tachycardia, tachypnoea, hypertension, or hypotension, and decreased oxygen saturation (SpO_2) or cardiac rhythm abnormalities [2].

Age, gender, family history, and ethnicity or race are the non-modifiable risk factors for CAD. Men are at higher risk than women. There is increased risk for men older than age 45 and women older than age 55. Anyone with a first-degree male or female relative who developed CAD before age 55 or 65, respectively are at higher risk. Elevated levels of serum cholesterol, low-density lipoprotein cholesterol, and triglycerides; lower levels of high-density lipoprotein cholesterol; type 2 diabetes, cigarette smoking, obesity, sedentary lifestyle, hypertension and stress are the modifiable risk factors [2].

Cardiac Rehabilitation aims at the facilitation of recovery and prevention of further cardiovascular disease [5]. Patient assessment, exercise training, physical activity counselling, tobacco cessation, nutritional counselling, weight management, aggressive coronary risk-factor management and psychosocial counselling are the core components of Cardiac Rehabilitation [6].

Nordic Walking (NW) is defined as ‘‘Scandinavian walking with poles’’. It is a form of outdoor physical activity which involves

walking with the use of poles adapted from cross-country skiing poles [7]. NW, in its current form, was invented in 1920s by a Finn as a summer workout for skiers [8]. It is a simple and feasible form of physical activity. NW can be done by nearly everybody, everywhere, and at almost any time [9]. NW is also called fitness walking using specially designed poles. The purpose of NW is activating the upper body during walking. NW is combination of skiing, sport walking, and trekking. It has gained recognition as an exercise since the late 80s, but has gained worldwide attention only a few years ago as a popular form of recreation, sport, and rehabilitation. NW is the form of physical activity that is gaining fastest-development [8].

Upper and lower body exercise training is simultaneously combined in NW. The walker applies force to the poles through the arms with each stride and thereby muscles of the arms, shoulders, upper back, chest and core muscles are stimulated. People with lower body joint pain and muscle weakness can walk more effectively with the use of NW poles [10].

Brisk walking is low-impact, functional, safe and affordable form of physical activity [10]. Sedentary lifestyle risks can be effectively counteracted with Brisk walking even in the most unfit and it leads to a reduced prevalence of chronic diseases [9]. Walking is eminently suited to physical activity prescription for inactive individuals. It doesn't require any special skills or facilities and it is accessible to men and women of all ages and poses little risk of injury [11]. Walking is widely recommended for physical reconditioning as an endurance exercise [12]. Walking is often described as the nearest activity to perfect exercise. It is the most common activity of choice when adults are counselled to incorporate additional physical activity into their lives. Brisk walking can be used as a means of active commuting, because it is more likely to be adopted and sustained than traditional exercise programs [11]. Walking can be done at ease at any time, any place, and without any equipment. It is as useful as any other aerobic activity if done over a long term [13].

Need for the Study

We conducted this study on ACS patients who are on medical management because secondary prevention of cardiovascular disease is very important in these patients to decrease morbidity and mortality. In this study, we aim to achieve this through Cardiac rehabilitation supplemented with either Nordic Walking or Brisk Walking. Raise in ACS prevalence emphasized the need to find the most effective Cardiac rehabilitation program. There is lack of awareness on the effectiveness of NW where both upper body and lower body exercise training can be done simultaneously. Scarcity of studies on such newer rehabilitation strategies for ACS patients on medical management who strongly require secondary prevention urged me to conduct this study.

Aim and objectives

The aim of this study is to compare the effectiveness of cardiac rehabilitation supplemented with Nordic Walking to that of cardiac rehabilitation supplemented with Brisk Walking in patients on medical management after an acute coronary syndrome and to observe the improvement of pre and post values.

Materials and methods

Method of Data collection: 40 subjects fulfilling inclusion criteria were recruited from cardiology department, KIMS hospital, after obtaining consent forms. Group A was given Cardiac rehabilitation with Nordic walking and Group B was given Cardiac rehabilitation with Brisk walking for a duration of 12 weeks. Study Design was Randomized Experimental Study. Follow up was done after 2 weeks by comparing pre and post values of the treatment study.

Inclusion criteria: Male and female subjects aged 40 to 70 years, 3 weeks after an acute

coronary syndrome, on Medical management whose Exercise tolerance >6 metabolic equivalents in symptom-limited electrocardiography treadmill exercise test and Ejection fraction by echocardiography ≥40%

Exclusion criteria: Previous episodes of cardiac arrest, Uncontrolled arrhythmias, Decompensated heart failure, Cardiomyopathy, Diabetes on insulin treatment, Liver or renal failure, Neoplastic disease, Spinal injuries, Recent Thrombophlebitis and Recent surgeries.

Materials: Nordic Walking poles, Static cycle, Pulse oximeter, Stop watch, 30-cm ruler, Stepper and Dumbbells.

Procedure

Cardiac Rehabilitation for both Group A and Group B:

Phase 1

Inpatient Cardiac rehabilitation is given to the patient in the hospital.

Phase 2

Frequency: 4 sessions per week
Duration:
Warm up: 10 minutes
Aerobic Endurance training: 30 minutes
Cool down: 10 minutes
Total session duration: 50 minutes

Warm up (10 min):

Intensity: very light, light (9-11 using Borg scale)

- Walk on spot x 1 min; Heel digs x 16; Walk on spot x 1 min; Side taps x 16; Walk on spot x 1 min; Side steps x 16; Walk on spot as you lift and lower the shoulders x 4; Walk on spot as you circle your shoulders x 4; Side bends x 2 each side; Walk on spot x 1 min; Trunk twist x 2 each side; Walk on spot x 1 min

Aerobic Endurance Training (30 min):

Intensity: Moderate (Borg 11-13) "Exertion without discomfort"
Each exercise is done for 1 minute.
Circuit is completed in 20 minutes.

1) Sit to stand – a) high chair; b) low chair; c) Squats
2) a) Arm curl (sitting down); b) Arm curl (standing); c) Side steps; d) Side steps with arm curls, light weights
3) a) Forward arm lift using light weight; b) Knee lifts; c) Knee lifts with arm raise
4) Step up – a) low step; b) high step; c) high step with arm raise
5) a) Wall press-ups; b) Chest press; c) March on spot; d) Jog on the spot
6) Step up –a) low step; b) high step; c) high step with arm raise

After the circuit is completed, patient is instructed to do static cycling for 10 min.

Cool down (10 min):

Intensity: Light to extremely light (8-11 using Borg scale)

- Gentle marches on the spot x 1 min; Side steps x 8; Gentle marches on the spot x 1 min; Side taps x 8; Gentle marches on the spot x 1 min; Heel digs x 8; Gentle walks on the spot x 1 min[14]

Phase 3

Frequency: 5 sessions per week
Duration:
Warm up: 10 minutes
Aerobic Endurance training: 40 minutes
Cool down: 10 minutes
Total session duration: 60 minutes

Warm up (10 min): Same as Phase 2

Aerobic Endurance Training (40 min): Exercises same as Phase 2, Circuit is completed in 20 min, Static cycling for 20 min.

Cool-down (10 min): Same as Phase 2

Group A: Nordic Walking

Phase 2

Frequency: 4 times per week
Intensity: 70%-80% of HR_{max}
Duration: 50 min
Warm-up (10 min): Stretching exercises and breathing exercises
Main part (30 min)**:** The Nordic walking
Cool-down (10 min): Breathing exercises [7, 15]

Phase 3
Frequency: 5 times per week
Intensity: 70%-80% of HRmax
Duration: 60 min
Warm-up (10 min): Stretching exercises and breathing exercises
Main part (40 min): The Nordic walking
Cool-down (10 min): Breathing exercises

During the main part, 10 min break is given in between for rest.

Group B: Brisk Walking
Phase 2
Frequency: 4 times per week
Intensity: 70%-80% of HR_{max}
Duration: 50 min
Warm-up (10 min): Breathing exercises and slow pace walking
Main part (30 min): Brisk walking
Cool-down (10 min): Breathing exercises [15]

Phase 3
Frequency: 5 times per week
Intensity: 70%-80% of HRmax
Duration: 60 min
Warm-up (10 min): Breathing exercises and slow pace walking
Main part (40 min): Brisk walking
Cool-down (10 min): Breathing exercises

During the main part, 10 min break is given in between for rest.

Outcome Measures: Heart Rate (HR), Rate of Perceived Exertion (RPE) and Physical fitness (assessed with the Fullerton Functional Fitness Test which consists of six components: Arm curl, 30-second Chair stand, Back scratch, Chair sit and reach, 8-Foot Up and go and 6-minute walking test (6MWT)).

Statistical analysis
Data analysis was performed by SPSS (version 17) for windows. Alpha value was set as 0.05. Descriptive statistics was performed to find out mean, standard deviation for the demographic variable and outcome variables. Chi square test was performed to find out gender and dominance distribution among both groups. Unpaired t test was used to find out significant differences among demographic variable such as age. Unpaired t test was used to find out difference in scores between groups for HR, ARM Curl, 30-second Chair stand, Back Scratch, Chair sit and reach, 8-Foot up & Go and 6MWD. Paired t test was used to find out significant difference with in group for HR, ARM Curl, 30-second Chair stand, Back Scratch, Chair sit and reach, 8-Foot up & Go and 6MWD. Mann Whitney U test was used to find out significant differences among baseline data of the outcome variable such as RPE. Wilcoxon signed rank sum test was used to find out significant difference with in group for RPE. Microsoft excel, word was used to generate graphs and tables.

Results

After comparing the pre and post values in Group A, results indicate that there was a statistically significant improvement ($p<0.05$) in HR, RPE and all the components of Fullerton Functional Fitness Test.

After comparing the pre and post values in Group B, results indicate that there was a statistically significant improvement ($p<0.05$) in HR, RPE and 4 components of Fullerton Functional Fitness Test i.e. Arm curl, 30-second Chair stand, 8-Foot up and go and 6MWD. It was observed that there was no statistically significant improvement ($p>0.05$) in 2 components of Fullerton Functional Fitness Test i.e. Back scratch and Chair sit and reach.

On comparing the data of two groups, it was observed that Group A had a statistically significant improvement ($p<0.05$) over Group B in HR, RPE and 4 components of Fullerton Functional Fitness Test i.e. Arm curl, 30-second Chair stand, 8-Foot up and go and 6MWD. It was observed that there was no statistically significant improvement ($p>0.05$) in 2 components of Fullerton Functional Fitness Test

i.e. Back scratch and Chair sit and reach (**Tables - 1 to 3, Graph – 1 to 5**).

Table - 1: Pre-Post in Nordic Walking Group.

Sr. No.	Variable	Pre	Post	þ-value
1	HR	82.10±4.35	123.15±6.66	<0.00001
2	RPE	5.15±0.81	1.25±0.44	<0.00001
3	ARM Curl	5.00±1.08	6.85±1.18	<0.00001
4	30-second Chair stand	5.35±1.14	9.65±1.14	<0.00001
5	Back Scratch	-4.90±4.61	-4.65±4.33	<0.021
6	Chair Sit & Reach	-5.95±3.69	-5.70±3.42	<0.021
7	8-Foot up &Go	11.80±1.11	9.35±1.18	<0.00001
8	6MWD	226.50±41.85	293.65±54.85	<0.00001

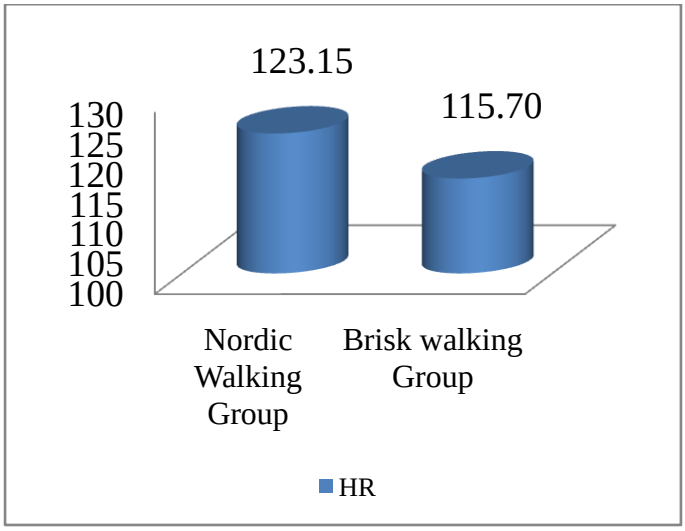
Table - 2: Pre-Post in Brisk walking Group.

Sr. No.	Variable	Pre	Post	þ-value
1	HR	82.75±4.49	115.70±6.34	<0.00001
2	RPE	4.80±0.95	2.05±1.19	<0.00001
3	ARM Curl	4.90±1.17	5.75±1.07	<0.00001
4	30-second Chair stand	5.45±1.28	8.40±1.19	<0.00001
5	Back Scratch	-5.25±4.31	-5.15±4.30	>0.163
6	Chair Sit & Reach	-5.70±3.85	-5.60±3.84	>0.163
7	8-Foot up &Go	11.60±0.88	10.10±0.85	<0.00001
8	6MWD	225.40±39.33	264.30±30.11	<0.00001

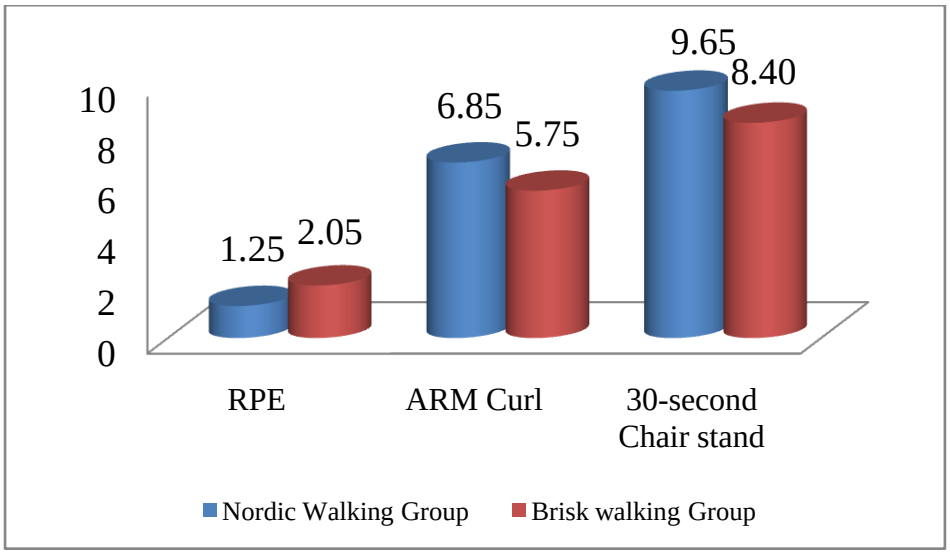
Table - 3: Difference between groups.

Sr. No.	Variable	Nordic Walking Group	Brisk walking Group	þ-value
1	HR	123.15±6.66	115.70±6.34	<0.0001
2	RPE	1.25±0.44	2.05±1.19	<0.0088
3	ARM Curl	6.85±1.18	5.75±1.07	<0.004
4	30-second Chair stand	9.65±1.14	8.40±1.19	<0.002
5	Back Scratch	-4.65±4.33	-5.15±4.30	>0.716(NS)
6	Chair Sit & Reach	-5.70±3.42	-5.60±3.84	>0.931(NS)
7	8-Foot up &Go	9.35±1.18	10.10±0.85	<0.027
8	6MWD	293.65±54.85	264.30±30.11	<0.043

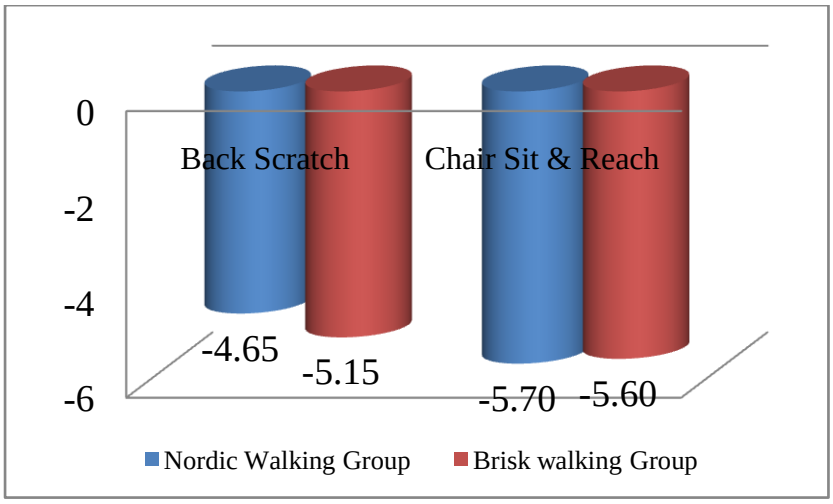
Graph - 1: Difference between groups for HR post.



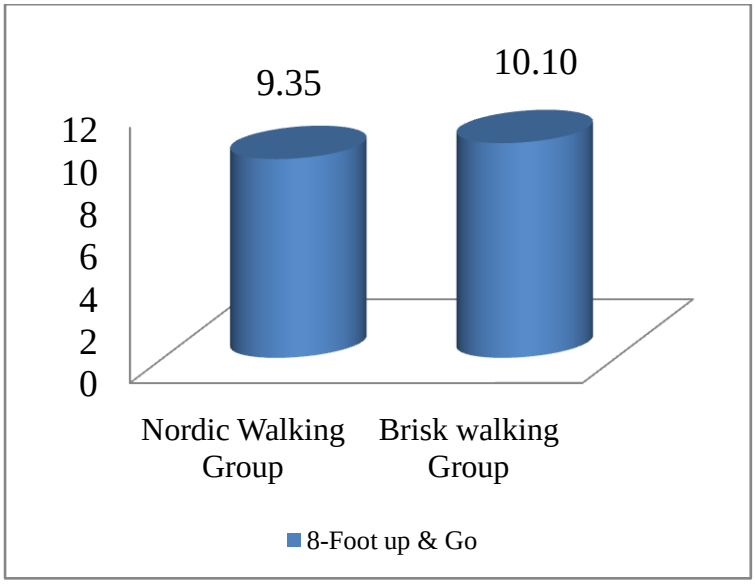
Graph - 2: Difference between groups for RPE, ARM Curl & 30-second Chair stand post.



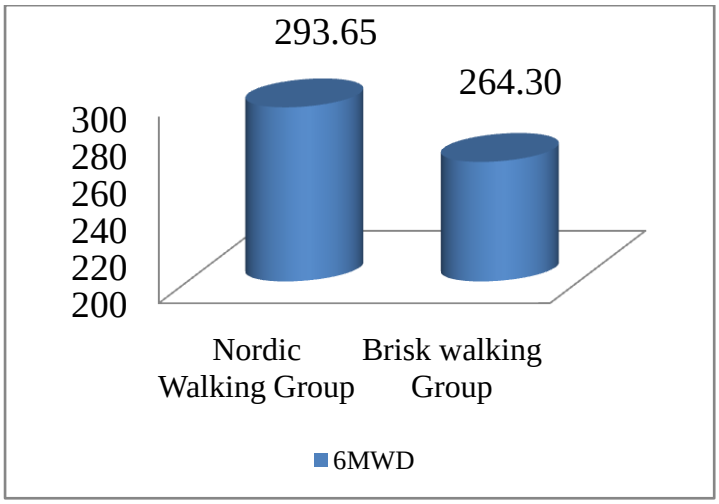
Graph - 3: Difference between groups for Back Scratch & Chair Sit & Reach post.



Graph – 4: Difference between groups for 8-Foot up & Go post.



Graph - 5: Difference between groups for 6MWD post.



Discussion

This was a Comparative study between Cardiac rehabilitation with Nordic Walking and Cardiac rehabilitation with Brisk Walking in patients on medical management after an Acute Coronary Syndrome.

The results show that Cardiac rehabilitation with Nordic Walking is having better effect on HR, RPE and Physical fitness on ACS patients compared to Cardiac rehabilitation with Brisk Walking. The result of the study supports Alternate Hypothesis that there will be a significant difference between Cardiac rehabilitation with Nordic Walking and Cardiac rehabilitation with Brisk Walking.

In a study by P Kocur, et al., it was stated that a 3-week, inpatient Cardiac rehabilitation programme supplemented with Nordic Walking showed more improvement in Exercise capacity and Physical fitness than Cardiac rehabilitation supplemented with Traditional Walking training or only Cardiac rehabilitation programme [16].

Other study by H. Figard-Fabre, et al., stated that use of NW poles increased physiological responses like Ventilation, oxygen consumption, Energy cost, Heart rate at a given speed but

decreased RPE in comparison with Walking during inclined level. Moreover, this study showed that a learning period of NW technique permitted to enhance the difference between Energy Cost with NW poles versus the Walking condition and to decrease the RPE when using NW poles [17].

These statements were proven right again in this study by comparing the pre and post Cardiac Rehabilitation with Nordic Walking intervention data which is showing a statistically significant improvement with $p<0.05$ in HR, RPE and Physical Fitness.

It was observed that there is a statistically significant improvement with $p<0.05$ in HR, RPE, Arm curl, 30-second Chair stand, 8-Foot up and go and 6MWD between pre and post Cardiac rehabilitation with Brisk Walking intervention data.

But when both these interventions are compared, Cardiac rehabilitation with Nordic Walking is having a better effect than Cardiac rehabilitation with Brisk Walking to improve HR, RPE and Physical fitness (Arm curl, 30-second Chair stand, 8-Foot up and go, 6MWD in Fullerton Functional Fitness Test). This is evident as there is a statistically significant difference with $p<0.05$ between the two groups in all these measures. Some components of Fullerton Functional Fitness Test like Back scratch and Chair sit and reach did not show any statistically significant improvement ($p>0.05$).

Nordic Walking improved Physical fitness. This is evident through improvements in all the components of Fullerton Functional Fitness Test.

Limitations

The study population was not typical for inpatient cardiac rehabilitation, for safety reasons, we selected patients with good exercise tolerance, at relatively low risk. Several risk factors are excluded in exclusion criteria.

Our study involved a relatively small and convenient sample. However, this does not appear to have caused problems with statistical analysis, since significant effects were observed, but it does limit the generalizability of our findings.

Another limitation is that we did not measure peak oxygen uptake to assess exercise capacity.

Finally, our study was of short duration, so the long-term effects of Nordic Walking on HR, RPE and physical fitness in patients participating in early cardiac rehabilitation remains to be studied.

Recommendations

We can compare the improvements in physiological responses and physical fitness with long term Cardiac rehabilitation supplemented with Nordic Walking and Brisk Walking.

VO_2 max can be calculated to assess exercise capacity.

The study can be performed on a larger sample to increase the generalizability of the findings.

Conclusion

Both Cardiac rehabilitation with Nordic Walking and Cardiac rehabilitation with Brisk Walking are found to cause significant improvement in ACS patients on medical management, but Nordic Walking has a better effect than Brisk Walking in increasing HR with a concurrent decrease in RPE and improvement in Physical fitness. This is proved as there is a statistically significant difference between the two groups.

Thus, Cardiac rehabilitation supplemented with Nordic Walking is more effective than Cardiac rehabilitation supplemented with Brisk Walking to improve physiological responses like HR and

RPE and also to improve Physical fitness in ACS patients.

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