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Efficacy of Nordic Walking in the Rehabilitation of Post-COVID-19 Syndrome Patients: An Original Article

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Abstract

Analysis indicates that a large number of COVID-19 survivors persist with reduced diffusion capacity and worsened perceptions of their physical and mental health even after six weeks of discharge from long-term hospitalization and isolation. Nordic walking (NW) is a unique method that involves an appropriate walking technique, posture, and the use of poles, which engages both the lower and upper body muscles, accounting for approximately 90% of the body's total muscle effort. NW increases maximum oxygen uptake, exercise capacity, resting heart rate, blood pressure, and quality of life in individuals across various scenarios.

Methods

70 Post COVID-19 (PC-19) patients were divided into two groups using simple random sampling, recruited from the COVID center of Shalinitai Meghe Superspeciality Hospital, Sawangi (M), Wardha. Based on the criteria determining inclusion and exclusion, the age of the patients ranged from 30-60 years. Group A was given conventional aerobic training as walking, and Group B was given NW training for 20-60 minutes each, alternate days a week for 4 weeks. Pre and post-intervention values were noted for the Incremental shuttle walk test (ISWT), World Health Organization Quality of Life, Short Form (WHOQOL-BREF), and Depression Anxiety Stress Scale (DASS-21). The statistical analysis of the results was done after the data was collected.

Results

Group B has improved better in Incremental shuttle walk distance (ISWD), physical function domain, and psychological domain of WHOQOL-BREF than Group A.

Conclusion

The study has shown that NW can be an advantageous rehabilitation regime in PC-19 patients to enhance walking endurance, overall quality of life, and reduce anxiety, depression, and stress.

Keywords: *Long COVID, Pole walking, Physical therapy, Nordic Walking*

1. Introduction

Since its emergence over three years ago, the Corona Virus, formerly known merely as the Wuhan virus, has spread throughout the world, including India. Countries throughout the world raised the alarm to be cautious [1]. To prevent the epidemic, lockdown and stay-at-home techniques were implemented. Amidst these precautions, the second wave of the epidemic swept over the country, affecting a large number of individuals. COVID-19's

symptoms resembled previous viral respiratory infections quite closely. The virus spreads within humans via close physical interaction. Cases varied from moderate to severe, resulting in critical health issues or even death. [2]. Initial symptoms included cough, abrupt onset of fever, and breathing difficulties. Twenty percent or more of confirmed cases were categorized as severe. However, numerous patients have received effective treatment and have been discharged from the hospital [3]. Physical problems faced comprised reduced functional capacity, inability to perform ADLs effectively, and lethargy. Large-scale physical and functional deconditioning occurred throughout the body as a result of COVID-19 disease, especially with a severe course involving prolonged bed rest, mechanical ventilation, and multiple organ involvement [4].

After-COVID symptoms have been seen not only in patients with severe symptoms but also in those who have had milder symptoms or no symptoms at all. Studies have shown that even non-hospitalized patients have similar symptoms after 2 months of infection. Most non-critical COVID-19 pneumonia sufferers have lower diffusion capacity and reduced perceived physical and mental health six weeks post-discharge [5]. Rehabilitation leads to an increase in functional ability, summarizes the impacts of deconditioning following longer ICU hospitalizations, and reduces stress by providing critical assistance throughout the recovery of COVID-19 survivors [6]. Walking in patients with respiratory problems is a preferable form of exercise in typical aerobic training programs. However, free walking engages fewer than half of the muscles in the body, including those in the lower body [7]. NW is a type of training that involves propelling yourself with a pair of long poles [8]. Till now, there is limited research that has used the NW program as a rehabilitative intervention in PC-19 patients, and its utility in providing quality of life, ambulatory endurance, and psychological well-being. Therefore, the current study compares the effects of an NW program and normal walking in individuals with PC-19 patients' walking endurance, quality of life, and psychological functions such as anxiety, depression, and stress.

2. Material and Methodology:

Once approval was obtained from the Institutional Ethical Committee of Datta Meghe Institute of Medical Sciences with approval number DMIMS(DU)/IEC/2021/246, the study was started. Following screening for the inclusion and exclusion criteria, 70 PC-19 patients were recruited for the study. The participants signed a written informed consent before the commencement of the treatment regimes. Those experiencing dyspnea/fatigue even after 6 weeks of hospital discharge after COVID-19 exposure, with a CT severity score ranging between 0-15; with ages 30-60 years of either gender; and who are hemodynamically stable were recruited as inclusives. They were screened on the basis of the 6MWT distance covered at the time of hospital discharge, up to 500 meters. Excluded were those who had pre-diagnosed cardiovascular or pulmonary disorders that might limit physical function.

3. Study Design and Research Procedure:

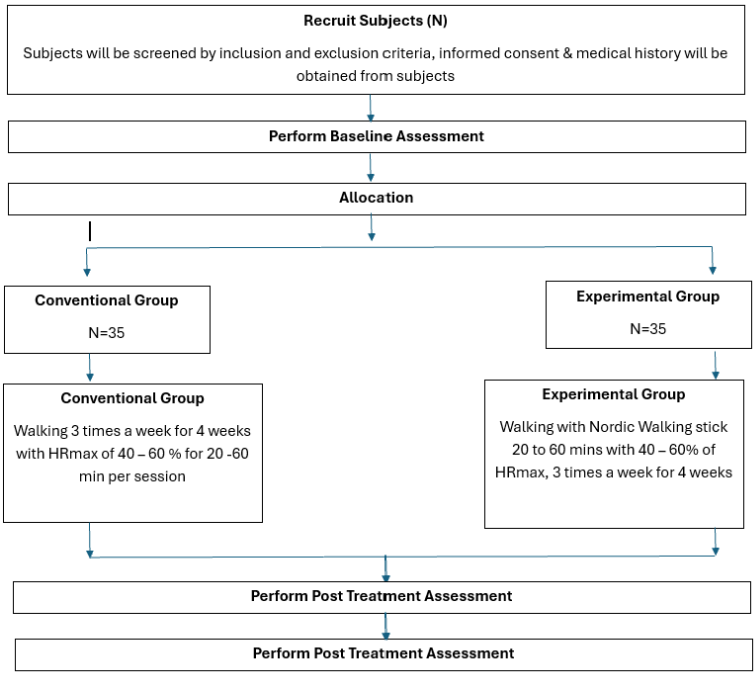
This was a comparative study that involved 35 patients, in each group, recruited from the COVID center of Shalinitai Meghe Superspeciality Hospital. All the patients on the day of discharge were instructed to perform daily activities with <3 METs along with breathing exercises and airway clearance techniques, if required, twice a day for 15-45 minutes, as tolerated, for 6-8 weeks, as per ERS, ATS guidelines [9]. The patients were contacted telephonically after 6 weeks and were asked about the sequelae of the symptoms. Demographic data, including age, gender, height, weight, and HRCT score, were obtained from each participant. The functional capacity was measured on the Incremental shuttle walk test (ISWT), and the distance was recorded on the basis of the number of shuttles completed by the patient. The DASS-21 questionnaire was used to evaluate patients' levels of stress, anxiety, and depression. Followed by which, the overall quality of life was measured using the WHOQOL-BREF scale. Following hospitalization after COVID-19 exposure, patients were randomly divided to receive either conventional aerobic training in the form of walking or NW initiated after 6-8 weeks of discharge. The intervention was given by the guided FITT principle. Termination

indicators in both groups were the same, which were as follows: temperature>38.2 degrees, chest tightness, chest congestion, dizziness, headache, palpitations, and inability to maintain balance.

4. Treatment Procedure

Group A (Conventional Aerobic Training) - The participants of Group A received walking as a form of aerobic training. The frequency of the exercises was 3 times a week up to 4 weeks, with an intensity of 40-60 % of HRmax for 20-60 minutes per session. All the patients were monitored throughout the treatment session for any adverse events.

Group B (NW Training) - Patients underwent the training session first, where they were familiarized with holding the poles, adjusting them to their heights, maintaining the proper posture while walking with the poles, and coordinating arms and legs. The patients were instructed to walk upright, looking forward. With the NW poles, patients were asked to walk with poles held close to the body. The walking pattern was explained to them. They were asked to move a foot forward while moving the opposite arm with the walking pole forward on the ground. The pole should be in contact with the ground first, followed by the foot. This pattern allows the body to be propelled forward while pushing the pole on the ground backward. Patients were asked to walk in this specific pattern, for 20-60 minutes as tolerated, keeping the intensity at 40-60% of HRmax. The training was given 3 times a week, for up to 4 weeks.
A common warm-up and cool-down phase was given to both groups, both before and after the treatment regimen. The warm-up lasted five to seven minutes and consisted of ten repetitions of the following exercises: trunk rotations, hip circles, ankle circles, spot marching, biceps curls, and shoulder circles. After the completion, there was the training phase. A 7–10 minute cool-down was conducted at the end, which included side bends, a child's pose, a single knee-to-chest stretch, a standing quadriceps stretch, seated hamstring stretches, and cow and cat stretches.



5. Data Analysis and Results:

The descriptive and inferential statistics used the Chi-square test, the student's paired t-test for inter-group analysis, and the unpaired t-test for intragroup analysis. The analysis was conducted using SPSS 27.0 and Graph-Pad Prism 7.0 versions. The significance level was set at $p<0.05$.

A total of 70 patients completed the study: 35 from Group A and 35 from Group B. The mean age of subjects in Group A was 46.85±8.89, wherein 48.57% were males and 51.43% were females; whereas, in Group B, the mean age was 45.48±8.99, wherein 40% were males and 60% were females.

Age Group(years)	Group A- Aerobic Training	Group B- NW
30-39 years	9(25.71%)	11(31.43%)
40-49 years	13(37.14%)	11(31.43%)
50-59 years	10(28.57%)	12(34.29%)
≥60 years	3(8.57%)	1(2.86%)
Total	35(100%)	35(100%)
Mean ± SD	46.85±8.89	45.48±8.89

Table 1: Patients' distribution based on age group

Gender	Group A-Aerobic Training	Group B- NW
Male	17(48.57%)	14(40%)
Female	18(51.43%)	21(60%)
Total	35(100%)	35(100%)

Table 2: Patients' distribution based on gender

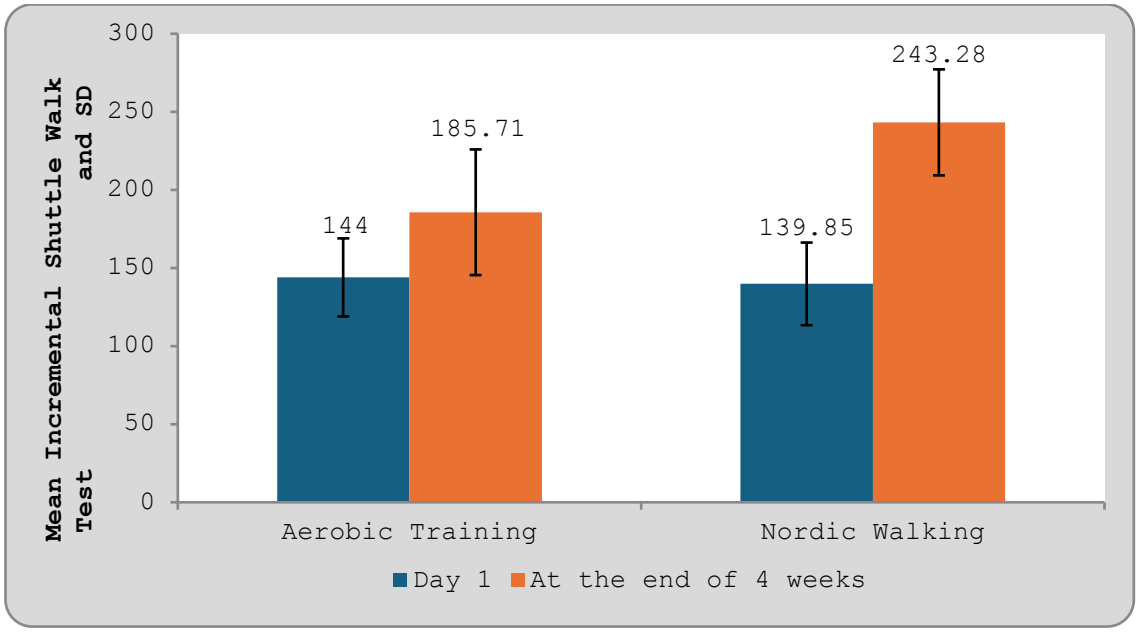


Figure 1: Comparison of pre- and post-intervention of both groups of ISWD

The pre- and post-intervention ISWD was found to be highly significant in Group B, calculated using the student's unpaired t-test with a t-value of 7.13, p=0.0001(p<0.05).

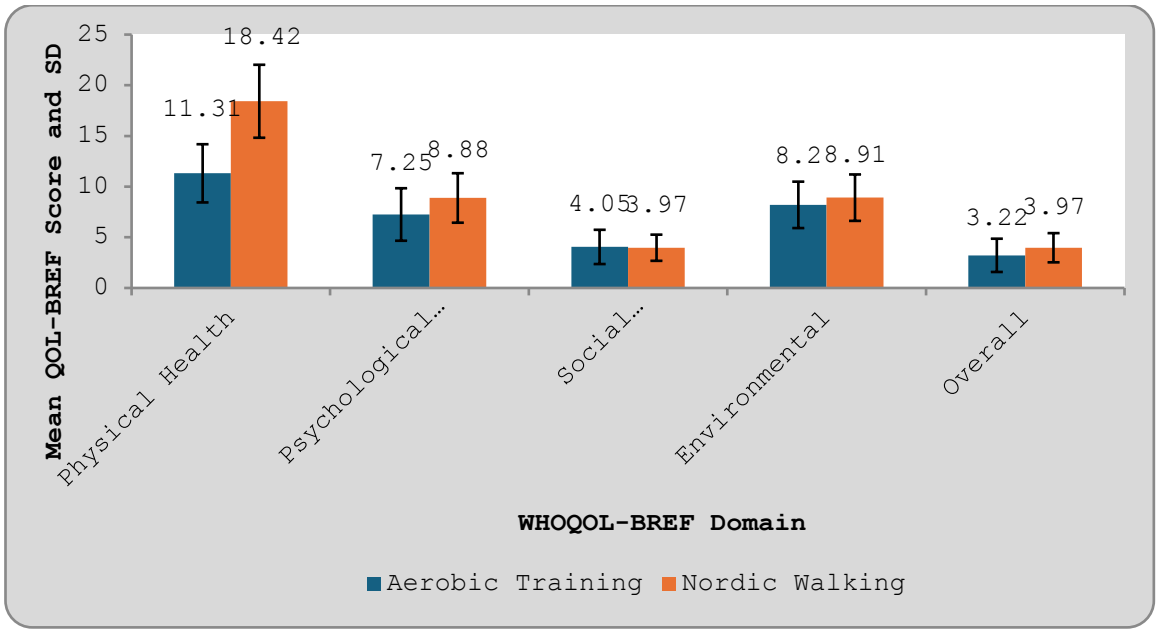


Figure 2: Comparison of pre- and post-intervention of both groups of WHOQOL-BREF

The pre- and post-intervention WHOQOL-BREF was found to be statistically significant in domains of physical health and psychological health in Group B, calculated using Student's unpaired t-test with t-values 9.12 and 2.70, respectively. However, when both the groups were compared for social relationships and environmental health, the differences found were not significant, with t t-value of 0.23, p=0.81, and t t-value of 1.30, p=0.19, respectively. Additionally, on overall health, a statistically significant difference was found, with the t-value 2.00, p=0.049.

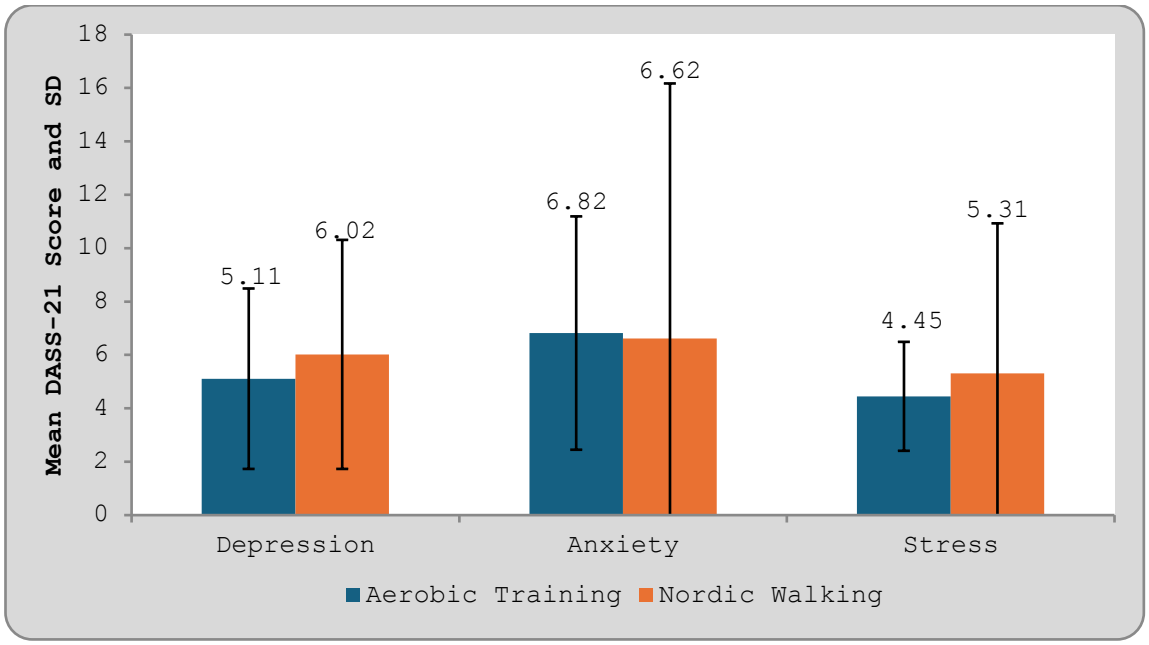


Figure 3: Comparison of pre- and post-intervention of both groups of DASS-21

The comparison of DASS-21 domains in both the groups analyzed showed that depression, anxiety, and stress showed an insignificant difference with t value 0.98, p=0.32; t value 0.11, p=0.11; and t value 0.84, p=0.40, respectively.

6. Discussion:

The major conclusions of the study showed that there was a considerable difference between the pre- and post-periods in both groups ($p<0.05$). The current study, with 4 weeks of NW intervention, contributes to a greater amount of evidence showing improvement in the overall functioning capability of an individual having PC-19 symptoms. The completion rate was high, and no adverse effects were found during the intervention, which shows a high acceptability. NW in this study, results have shown a significant improvement in ISWD, owing to the fact that it had improved ambulatory endurance after 4 weeks of intervention. The possible reason for improvised exercise capacity after NW can be explained by enhanced respiratory muscle function as a result of enhanced respiratory mechanics, being consistent with the results of a study done by Ochman et al (2018), where NW has shown improvement in exercise tolerance, perception of breathlessness, and quality of life in lung transplantation patients [10]. Also, improved distance covered in the ISWT can be justified with the use of poles, which causes longer strides that could enable the calf muscles to have more time for recovery, thus maximizing the limited blood supply, along with which shift in weight distribution through the legs may clarify why the patients can walk more after the NW training. This finding is consistent with the findings of Oakley et al (2008), who performed a study on patients with intermittent claudication and stated that patients can walk more quickly when they utilize the walking poles [11]. Furthermore, a similar intervention study was done, which was the first of its kind, in 60 COPD patients, proving its effectiveness in reducing dyspnea, improving quality of life, and functional exercise capacity. A study done by Nagyova et al states that a 3-week NW program is a beneficial and safe exercise training modality when compared to free walking in terms of better functional performance and quality of life in the coronary artery disease population, supporting our results, where a statistically significant difference was found when ISWD of both the groups were compared post-treatment [12]. The present study corroborates with the systematic review done by Hekmatikar et al (2022) showing the beneficial effects of walking, treadmill running, or cycle ergometer with exercise intensity of 40-60% of maximum heart rate has shown improvement in quality of life, eventually imposing a positive psychological response in PC-19 patients discharged from hospital [13]. However, the present study has shown improvement in the physical and psychological health in NW programs consistent with the results of Gomenuka et al (2019), who stated that NW over free walking results in greater improvement in physical and psychological-related quality of life in the elderly population [14]. Besides, when the present study compared the social and environmental aspects of quality of life, the statistical difference in intergroup analysis was significant, which shows that both exercise training regimes are effective in improving the quality of life. Whereas, when intragroup analysis for the same was done, there were no statistically significant differences found, because exercise training, of any kind, is effective enough in improving the social and environmental

health of a person. A study done by Ponce-Campos et al (2022) on PC-19 patients evaluated the effect of a physiotherapy program consisting of a 4-week intervention consisting of breathing exercises, progressive relaxation exercises, energy conservation techniques, and aerobic exercise training involving free walking on a treadmill or stationary bike. The results attributed to an improvement in the mental health status of the population when recorded pre- and post-intervention on the DASS-21 scale, focused on measuring anxiety, depression, and stress, which is consistent with this study's results in the group aerobic training [15]. Unswerving with the results of this study showing a statistically significant difference in reducing anxiety, depression, and stress in the NW group, is a study done by Park et al (2015), in the elderly population with depression, examining the effect of NW. Their results suggest that NW shows a significant reduction in depression in such a population when used as an exercise intervention [16]. Additionally, a study done by Soboleva et al (2016) assessed the impact of NW training on elderly women's level of social well-being, utilizing the muscles that are not engaged when walking normally, which makes the patient exercise with relatively higher intensity, but at a lower level of perceived exertion. The study's findings have shown that NW has a positive impact on the psychological as well as physical health of women. It enlightened their mood, their sleep improved, and they observed an increase in their efficiency [17]. However, in the results of the present study, when a comparison of both groups was done, there was an insignificant statistical difference in all the domains, namely anxiety, depression, and stress. On the contrary, NW and climbing exercise, when compared with a no-exercise group by Bichler et al (2022), in anxiety disorder patients, new insights during and after the exercise sessions were recorded regarding the anxiolytic effect of exercise. Both exercise interventions were considered appropriate exercise modalities for emotion regulation in such patients [18]. In future more studies can be conducted to assess the long term effect of the intervention and a study with large sample size needs to be conducted to establish strong level of evidence.

7. Conclusion:

In conclusion, this research offers support that NW is beneficial in PC-19 patients to enhance walking endurance, overall quality of life, and reduce anxiety, depression, and stress. NW has shown a more significant benefit in improving the functional capacity of PC-19 patients when compared to walking. Results have shown that a 4-week training regime of NW and conventional aerobic training with moderate intensity was sufficient to produce improvements in patients with PC-19 symptoms. Additionally, both exercise programs could improve patients' quality of life by lowering psychological symptoms like anxiety, depression, and stress.

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