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RESEARCH ARTICLE

PHYSICAL THERAPY IN DIABETIC PATIENTS INFECTED WITH COVID-19 ACUTE AND POST-ACUTE RECOVERY

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Abstract

Diabetes is the second highly prevalent disease among chronic diseases in patients with COVID-19 and is responsible for high morbidity and mortality in COVID-19 patients. Diabetic patients with uncontrolled glycemic levels have a worse prognosis than patients who have strict glycemic controls. During the COVID-19 pandemic, the importance of social distancing measures has reduced physical activity in people due to home quarantine and lockdowns. COVID-19 disease can affect the functional capacity and occupational health of diabetic patients. This fact urges the need for physical therapy during the active and recovery phase of COVID-19 disease. This review study has analyzed the effects of physical therapy in COVID-19 patients previously suffering from diabetes during the active and recovery phases. Different articles were retrieved from PubMed and a literature review was conducted. A complete evaluation of different studies revealed four topics that correspond to the results of this study. 1) Physical therapy in non-hospitalized diabetic patients suffering from COVID-19 disease; 2) Physical therapy in hospitalized and ICU diabetic patients suffering from COVID-19 disease; 3) Physical therapy in diabetic patients recovering from COVID-19 disease; 4) Role of physical therapists in the battle against COVID-19. The findings of the previous studies showed that COVID-19 has significant effects on the physical capacity of sufferers especially those with a chronic disease like diabetes. This fact implies that physical therapists should also be involved in the battle against COVID-19 diseases for improving the functional capacity during both the active and recovery phase of the illness.

Introduction:-

COVID-19 is an illness caused by SARS-CoV-2 that is an upper respiratory tract virus and causes the severe acute respiratory syndrome. It is a highly contagious virus and enters the human body through the upper respiratory mucus membrane causing infection. The SARS-CoV-2 produces a wide range of symptoms in humans ranging from mild symptoms such as fever, sore throat, cough, nausea, diarrhea, vomiting, and mild dyspnea to severe acute respiratory distress syndrome that can cause pneumonia, dyspnea, and even death. Patients that have multiorgan failure are at increased risk of severe forms of SARS-CoV-2 infection. [i]

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The effects of COVID-19 illness are not usually restricted to the respiratory system but can involve other systems such as renal, cardiovascular, nervous, musculoskeletal, and endocrine systems. The principal factors responsible for multiorgan involvement include old age, obesity, diabetes, hypertension, cardiovascular diseases, and previous respiratory diseases such as asthma, tuberculosis, etc. [ii]

Patients that develop severe acute respiratory distress syndrome or other organs involvement require a prolonged hospital stay and mechanical ventilation. Postoperative intensive care syndrome is a serious side effect associated with prolonged hospitalization and mechanical ventilation. In this syndrome, there is severe impairment of physical, psychiatric, and cognitive functions. [iii]

According to previous information, COVID-19 is more prevalent in people with comorbidities. The most highly prevalent comorbidities associated with COVID-19 are hypertension, diabetes, and cardiovascular diseases. The data has suggested that COVID-19 is strongly related to high glucose levels, particularly in type 2 diabetic patients. As we know, diabetes is one of the most highly prevalent diseases in most parts of the world, so it is important to study specific characteristics of SARS-CoV-2 in diabetic patients. [iv]

According to studies, the diabetic patients that have COVID-19 disease in previous outbreaks of infection developed reduced musculoskeletal and respiratory capacity during the disease. These limitations continued to affect people years after the end of COVID-19 disease. In addition to COVID-19 patients, healthy individuals and those with comorbidities have developed reduced functional capacity due to sedentary lifestyles promoted by social distancing measures such as lockdowns and home quarantines. Individuals with musculoskeletal disorders and chronic diseases are more prone to this type of illness. Physical therapists can play a vital role in saving people from different outcomes of the COVID-19 pandemic and can help other healthcare professionals for better management and rehabilitation of the patients. In addition to this, they can contribute to assisting people in functional independence and better occupational health. [v]

Methods:-

The aims of this review article were achieved through a literature review. This review involved the following steps:

1. Topic selection
2. Research question defined
3. Methodological design
4. Inclusion and exclusion criteria
5. Literature collection and selection
6. Evaluation of included studies
7. Interpretation of the results

Articles were retrieved from PubMed (the United States National Library of Medicine) in March 2022 using the Keywords: Physical therapy, COVID-19, diabetes, comorbidities, acute disease, recovery phase, and rehabilitation in English. The terms were combined using the Boolean operator “AND” to find literature that comprised all related keywords. The inclusion criteria included full-text availability; English language; having “Acute and Recovery phase of COVID-19”, “COVID-19 and physical therapy,” and “COVID-19 and Diabetes” as the chief research topic. The reference lists of the review articles included in the review were also hand-searched.

Discussion:-

Physical Therapy In Non-Hospitalized Diabetic Patients Suffering From Covid-19 Disease

The novel coronavirus causes a wide range of symptoms in the patients, however, the severity of these symptoms and COVID-19 infection can be divided into four stages including mild, moderate, severe, and critical disease. According to reports, more than 80% of the patients infected with the virus develop mild symptoms and recover from the disease without hospitalization. In mild cases, there are normal radiological findings with influenza-like symptoms. In diabetic patients with strict glycemic control, the infection is usually mild and patients recover with symptomatic treatment. However, compared with healthy individuals, there is a mild functional limitation which can be due to several factors including age, obesity, prior sedentary lifestyle, etc. Another important thing to consider is that there is no fever in some cases of COVID-19 infection, so you cannot rule out COVID-19 infection if the patient is afebrile. Diabetic patients with poor glycemic control usually do not present with mild symptoms of the disease. Patients with mild disease should be isolated at home for 14 days after the appearance of symptoms. It can

help to prevent disease spread and also better for the health of the patient. In addition to symptomatic treatment, non-pharmacological measures also improve the patient's outcome and decrease the clinical course of the disease. [vi]

Rehabilitation professionals especially physical therapists play a major role in the quarantine period by helping the patients improve their life quality and functional capacity. According to studies, when the person is in isolation, he/she spends more time sitting or lying down that can decrease muscle strength and physical intolerance. In addition to this, musculoskeletal symptoms may also develop including arthralgias and myalgias. In patients with comorbid diseases or obesity, the risk of deep venous thrombosis is also increased, which is a life-threatening condition. The patients who are in isolation should follow physical therapy protocols including muscle stretching and strengthening exercises, balance training, and mild intensity aerobic exercises. These physical therapy protocols are prescribed because of the strong scientific evidence that supports their role in strengthening the immune system, cardiovascular health, and other physical and physiological functions of the body. [vii viii]

Physical therapists can also help patients in reducing respiratory symptoms by improving respiratory muscle functions and providing their assessment about whether the patient needs hospitalization or not. For assessing the need for hospitalization, the clinical assessment of dyspnea and evaluation of oxygen saturation by a physician is also important, in addition to physical therapy consultation. The physical therapists usually recommend respiratory exercises to aid the patients in improving disease course and prognosis and better respiratory health in the post-recovery and after-recovery phases. [ix x]

Secretion clearance techniques can be used in patients with difficulty in expectorating sputum, but they carry certain risks. The principal risk includes the transmission of COVID-19 infection related to these procedures. Due to this fact, procedures involving secretion drainage and respiratory flow changes should be used after carefully assessing their benefit-risk analysis. [xi]

Physical Therapy In Diabetic Patients Requiring Hospitalization And Icu Care For Covid-19 Disease

According to studies, 20% of patients with COVID-19 infection require hospitalization and most of the hospitalized patients with COVID-19 infection are suffering from comorbid or immunosuppressive conditions. In addition to this, various other factors are also involved in the hospitalization of COVID-19 patients including high-exposure rate, untreated mild to moderate cases, etc. Out of 20% of cases that require hospitalization, 15% are severe and 5% are critical. The most common symptoms associated with hospitalization in COVID-19 patients include fever, dyspnea, headaches, cough, chest pain, arthralgias, mental confusion, sore throat, and body aches. [xii]

Patients with moderate symptoms of the disease admitted to the hospital due to any indication can benefit from physical therapy to control symptoms of the disease. Physical therapists can assist the patient to perform respiratory physical therapy and constantly assess the need for respiratory therapy in COVID-19 patients. In patients with severe cough with sputum, respiratory physical therapy can help to prevent the accumulation of sputum in the airway. Physical therapy thus helps to increase lung compliance in patients with COVID-19 disease. All these measures are especially important in patients with comorbid conditions that can lead to increased airway secretion or ineffectual cough. Diabetic patients with neuropathy (an important and common complication of diabetes) are prone to increased secretions in the respiratory tract that can be managed by respiratory physical therapy with no adverse outcomes. [xiii xiv]

The role of physical therapists is not confined to better respiratory function in the hospitalized patient; they play a vital role in addressing the problems associated with acute stages of illness, particularly associated with immobility during the hospital stay. In these cases, physical therapists can help patients to perform exercises that increase muscle strength, prevent the formation of bedsores by changing positions, and keep the patient active to reduce musculoskeletal problems. In diabetic patients, there is an increased risk of wound complications and deep venous thrombosis due to peripheral arterial diseases. Prolonged immobilization can lead to peripheral infarcts, necrosis, and gangrene. So, physical therapy is essential in COVID-19 patients already suffering from diabetes to reduce the risk of complications. Physical therapy also improves muscle strength and nerve functions which can decrease the risk of complications, such as peripheral neuropathy and muscle wasting in diabetic patients. Before starting physical therapy, the condition of the patient should be discussed with the physician. In some patients, due to specific reasons, physical therapy is completely or relatively contraindicated. [xv]

In critical cases, physical therapy is an essential part of intensive care. In intensive care units, physical therapists are part of teams that are responsible for the care of patients on ventilatory support and other operations in ICU. The role of physical therapists in ICU patients extends from their admission in ICU till they are discharged from ICU. Physical therapists are mainly responsible for the care of the patients and preventing complications including myopathy, neuropathy, bedsores, thrombosis, contractures, and postural instability. Diabetic patients admitted to ICU have the highest risk of developing all these complications as compared to other patients with no comorbid conditions. Physical therapy interventions such as early mobility can be employed to decrease the risk of complications that exaggerate with poor glycemic control including muscle wasting, peripheral arterial diseases, and neuropathy. It can enhance muscle strength and reduce the risk of cardiovascular, respiratory, and skin-related complications. [xvi xvii]

Physical Therapy In Post-Icu Recovery And After Hospital Discharge

ICU survivors' post-recovery from COVID-19 disease can develop illnesses such as post-ICU syndrome or post-intensive care syndrome. However, the patients with chronic comorbid conditions are more prone to developing these syndromes as compared to previously healthy patients infected with COVID-19. These conditions are associated with significant physical, emotional, and cognitive impairments that combined with previously diagnosed chronic disease can have even worse consequences. According to a research study conducted in the USA, about 71% of patients who recovered from ICU of hospitals have decreased financial earnings with little variability as per age of the patient and length of hospital stay. According to the same research, out of about 922 survivors post ICU care, 44% remained unemployed one year after discharge from the hospital. Prolonged immobility can lead to various complications that decreased the functional capacity of the patients. According to the research, common complications encountered in the patients that lead to decreased functional capacity and inability to work after ICU stay include orthogenic contractures, postural problems, muscle wasting and shortening, venous thromboembolism, neurogenic anomalies, and skeletal pathologies. [xviii]

According to recent literature, it has been proposed that interactions between complications of COVID-19 infection and features preexisting chronic diseases such as hyperglycemia, hypotension, hypertension, neuropathy, and myopathy can contribute to symptoms of post ICU syndrome. Those with poor chronic disease control such as uncontrolled hypertension and hyperglycemia can worsen the symptoms of post ICU syndrome in the recovery phase or post-discharge phase. In diabetic patients who suffered from COVID-19 infection, the post-discharge phase involved the occurrence of severe cognitive anomalies and peripheral arterial disorders. A large proportion of the patients do not return to their pre-admission health state. [xix xx]

A two-year retrospective study was performed in an ICU hospital setting on patients with ARDS. It was observed that a large number of patients with ARDS developed the clinical disease during their stay in the hospital and require a long hospital stay. About 1/4th of the patient with ARDS developed complications such as ventilation-associated pneumonia, post-ICU myopathy, and pneumothorax. Additionally, reviews of ARDS survivors, irrespective of cause, showed that these patients continue to have functional impairments, compromised health, poor quality of life, and a lot of hospital visits after ICU discharge. Other studies also continue to conclude poor outcomes after an ICU stay. [xxi xxii]

However, in one follow-up study of SARS-CoV-2, it was revealed that the survivors of COVID-19 disease showed significant recovery after 2 years of rehabilitation. The recovery was obvious through the radiological findings of lungs in which there is the regeneration of parenchyma and functional impairment reduced significantly in such patients. Another study however revealed that computed tomography of SARS patients after 15 years of discharge showed some fibrotic patches in the lungs. These results forced the authors to think about the rehabilitation of patients after COVID-19 disease can play a vital role in the functional capacity and occupational health of the patients including those with diabetes. [xxiii]According to an observational study on COVID-19 ICU survivors, it was revealed that those patients who participated in the rehabilitation program showed better respiratory and functional capacity as well as overall life quality. It is therefore important for the patients to regularly visit rehabilitation professionals at the prescribed time, especially those patients who required ICU care during the course of their disease or have comorbid conditions. The follow-up visits are important because COVID-19 infection can have immediate-, intermediate- and long-term effects on functional capacity, physiological well-being, and the return-to-work process. [xxiv xxv]

Role Of Physical Therapists In The Battle Against Covid-19

Physical therapists are front-line care providers in a battle against COVID-19 disease affecting diabetic patients. These professionals should be in the healthcare team and consulted appropriately in cases where diabetic patients are hospitalized due to COVID-19 disease. Physical therapy consultation can effectively provide education and in-depth covering of the limitations that a diabetic patient can face during the course of COVID-19 disease and provide suitable ways to counter restrictions of the body's movement system through different physical activity therapies.

Patients suffering from chronic conditions are not usually referred to physical therapists for complete physical activity programs suitable for them. In developed states like the USA, only 2% of diabetic patients are referred to physical therapy professionals as outpatient cases for the prevention of complications associated with diabetes. Most patients are only referred in case of some functional immobility such as limb pain or decreased mobility etc. Physical therapists should be promoted for regular physical therapy of patients suffering from chronic diseases such as diabetes. [xxvi]

Breathing Exercises that can help to improve your Respiratory Health during COVID-19 Disease:

When your lungs are healthy, you inhale and exhale naturally using your diaphragm. More than 80% of the work while breathing is done by your diaphragm resulting in the mixture of oxygen and other gases into your body and waste gases out of your body. In patients with respiratory illness or any other disease-causing generalized weakness, the diaphragm does not work to its full capacity. In response to this, the body starts to use other muscles such as the neck, back, and chest muscles for breathing. It results in decreased oxygen flow into the body and at the same time decreases the functioning of the diaphragm. To overcome these problems, some breathing exercises can increase the functional capacity of the diaphragm and oxygen flow inside the body. [xxvii] Here we will discuss some common and highly effective breathing exercises:

Pursed Lip Breathing:

One of the best breathing exercises for bed-ridden or severely ill patients is pursed-lip breathing. It allows the opening of airways for a prolonged period and reduces the accumulation of secretions in the airways. In addition to this, the body gets more oxygen compared with normal breathing. It is because of the technique you follow during pursed-lip breathing. You simply need to inhale using your nostrils and exhale using your mouth, at least twice as long as compared to inhalation.

Diaphragmatic Breathing:

It is another effective exercise for patients with respiratory illnesses such as COVID-19. You need to lie supine with a pillow under your head and knees and one hand on your chest and the other on the upper abdomen. Breathe slowly using your nostrils and your stomach should move out against your hand. The other hand on your chest should remain still. After this, you exhale with pursed lips with your stomach pushing your lungs upward, and your hand on the upper chest will remain still. [xxviii]

Leg and Arm strengthening Exercises:

Strengthening and range of motion exercises are important for sick patients to decrease the risk of muscle wasting and strengthen the functioning of muscles. Patients with mild to moderate COVID-19 disease can perform low-intensity aerobic exercises. However, for severely ill patients, limb exercises while laying on the bed are important. For lower extremity patient can perform heel slides, quad sets, ankle pumps, glutie sets, bridging, diaphragmatic strengthening exercises, hip abduction, gentle upper extremity exercises like shoulder flexion and abduction, elbow flexion and extension, wrist flexion and extension , grip open and close. If patients are more strong and able to get out of bed they should perform sit to stand from chair, slow marching in place, weight shifting exercise, side stepping, forward and backward walking, catch and throw ball, shallow squats as tolerated . All these exercises should be performed for 5-10 minutes each, 4 times a day. [xxix]

Results:-

In this review paper, we have briefly seen the literature available about the effects of diabetes on the COVID-19 disease course and prognosis, both during active and recovery phases, and the efficacy of physical therapy on such patients. COVID-19 has affected a significant proportion of the population including healthy and immunocompromised individuals. Physical therapy has profound benefits during the active and recovery phase of the COVID-19 infection in mild to severe and critical forms of the disease. Physical therapy is more important for the COVID-19 sufferers who have comorbid conditions such as diabetes as compared to otherwise healthy

individuals. It is due to the fact that they are more prone to complications of diabetes and COVID-19. Physical therapy can alleviate the risk of complications associated with both illnesses. Mild to moderate forms of disease require physical therapy in the form of aerobic exercises and stretching and strengthening techniques. Severe and critical forms of disease that require hospitalization need critical monitoring by healthcare professionals to reduce the risk of life-threatening complications. Physical therapy is equally important for recovery patients because COVID-19 infection significantly reduces the functional capacity of the patient that cannot be regained without proper rehabilitation services. Physical therapists should take part in the fight against COVID in patients with comorbid conditions as well as otherwise healthy individuals.

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