EFFECT OF EARLY FUNCTIONAL MOBILITY ON FUNCTIONAL INDEPENDENCE IN INCOMPLETE PARAPLEGIC INDIVIDUALS.

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ABSTRACT

Background: To study and find the efficacy of early functional mobility training on functional independence in incomplete paraplegic individuals.

Methods: Ethical clearance was taken from the Institutional Ethical Committee.This study was conducted in Krishna Hospital, Karad with a sample size of 40. Those who were willing to participate in the study were included in the study by using convinient sampling method for incomplete paraplegic subjects.Distal muscle strength was assessed by MMT and functional mobility was assessed by FIMS and SCIM before and after the study.Proximal muscle strengthening exercises were given that included exercises with assistance followed by active exercises and then with progressively with resistance. The intervention had been given for 12 weeks and treatment will be given 5 times a week.

Result: Manual muscle testing shows extremely significant improvement in lower limb muscle strength with p value of 0.0001. Pre interventional value of mean and standard deviation for hip flexors was (2.52±0.51)(right), (2.65±0.48)(left) and post interventional value of mean and standard deviation was (3.44±0.50)(right), (3.08±1.62)(left) and also shows extremely significant improvement in hip flexor strength that is p value of <0.0001. Pre interventional value of mean and standard deviation for knee extensors was (2.38±0.60)(right), (2.52±0.51)(left) and post interventional value of mean and standard deviation was(3.54±0.50)(right), (3.75±0.55)(left) and also shows extremely significant improvement in hip flexor strength that is p value of <0.0001. Pre interventional value of mean and standard deviation for ankle dorsiflexor was (2.52±0.51)(right), (2.65±0.48)(left) and post interventional value of mean and standard deviation was(3.44±0.50)(right), (2.79±2.14)(left) and also shows extremely significant improvement in hip flexor strength that is p value of <0.0001. Pre interventional value of mean and standard deviation for long toe extensor was (2.40±0.59)(right), (2.65±0.48)(left)and post interventional value of mean and standard deviation was(3.44±0.50)(right), (3.08±1.62)(left) and also shows extremely significant improvement in hip flexor strength that is p value of <0.0001.

Functional independence measure scale shows extremely significant improvement with p value of 0.0001. Pre interventional value of mean and standard deviation was (74.26±8.05) and post interventional value of mean and standard deviation was (96.92±8.04).

Spinal Cord Independence Measure scale shows extremely significant improvement with p value of 0.0001. Pre interventional value of mean and standard deviation was (37.34±5.08)and post interventional value of mean and standard deviation was (67.65±6.84).

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Conclusion: This study concludes that functional mobility exercise 5 times a week is beneficial to improve the functional independence in incomplete paraplegic individuals. It also prevents secondary complications in the rehabilitation period and helps improve the quality of life.

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Introduction

Incomplete Spinal Cord Injury

Spinal cord injury (SCI) is a relatively low-incidence, high-cost injury that results in tremendous change in an individual's life. Paralysis of the muscles below the level of the injury can lead to limited and altered mobility, self-care, and ability to participate in valued social activities.

Spinal cord injuries can be grossly divided into two broad etiological categories: traumatic injuries and non traumatic damage. Trauma is the most frequent cause of injury in adult rehabilitation populations. Injury results from damage caused by traumatic events such as motor vehicle accidents (40.4%), falls (27.9%), violence (15.0%), and sports (8.0%). Non traumatic damage in adult populations generally results from disease or pathological influence. Conditions that may damage the spinal cord are vascular dysfunction (arterio venous malformation [AVM], thrombosis, embolus, or hemorrhage); vertebral subluxations secondary to rheumatoid arthritis or degenerative joint disease; spinal neoplasms; syringomyelia; abscess of the spinal cord; infections, such as syphilis or transverse myelitis; and neurological diseases, such as multiple sclerosis and amyotrophic lateral sclerosis. Non traumatic etiologies account for approximately 39% of all SCI.

ISNCSCI defines a complete injury as having no sensory or motor function in the lowest sacral segments (S4 and S5). Sensory and motor function at S4 and S5 are determined by anal sensation and voluntary external anal sphincter contraction. An incomplete injury is classified as having motor and/or sensory function below the neurological level including sensory and/or motor function at S4 and S5. If an individual has motor and/or sensory function below the neurological level but does not have function at S4 and S5, then the areas of intact motor and/or sensory function below the neurological level are termed zones of partial preservation.

Incomplete paraplegia is an outcome of spinal cord injury that describes paralysis, and potentially loss of sensation, of the lower body. An incomplete injury is classified as having motor and/or sensory function below the level of injury.This means that an incomplete SCI survivor might still retain some function and feeling below the site of the injury.An incomplete injury is classified as having motor and/or sensory function below the level of injury.This means that an incomplete SCI survivor might still retain some function and feeling below the site of the injury. Spinal cord injury has a profound impact on many different body systems, which can greatly affect a persons ability to move, perform everyday task, and participate in expected social role. In India, the average annual incidence of spinal cord injury is 15000 with a prevalence of 0.15million.[17]

Effects of functional mobility exercises in incomplete spinal cord injury.

Early functional mobility training in rehabilitation improves the performance through goal directed practice and repetition. Patients will be taught to perform a problematic or painful task under varying practice conditions, with the goal of learning how to perform the task in a safe, independent, and pain-free manner. Evidence supports that If early rehabilitation is not followed properly then there are chances of increase in the duration of recovery. Which may lead to development of abnormal synergy patterns and sometimes individual will not able to gain complete recovery . Currently, evidence supporting the use of early functional mobility training in individuals with spinal cord injury will help to gain near complete and faster recovery. Limited evidence suggests that effect of early functional mobility will help to gain the functional independence in incomplete

paraplegic individuals, so it will help the individual to perform activities of daily living (ADL) in better way. In early functional mobility the main focus on bed mobility, sitting and transfer.

Materials and methodology: This was an experimental research with only one group and pre and post analysis was done . The sample was drawn from the spinal cord injury individuals visiting krishna hospital. The sample size of the study was 40 drawn from the formula

$$n = \frac{4SD^2}{[(M\times\sum)^2]}$$

Convenience Sampling method was opted. The study was carried out for 12 weeks.

Inclusion**:**Both males and females with incomplete spinal cord injury were included. Patients with incomplete paraplegia were taken. Spinal cord injury comes under ASIA impairment scale grade C and D.All the induviduals who were ready for voluntary participation were considered**.** Exclusion**:** Individual having any unhealed fracture site. Individual with impaired higher mental function. Individual having any congenital abnormality. Individuals having systemic illness.

Procedure: The study was started after being approved by institutional ethical committee of Krishna Institute of Medical Sciences Deemed to Be University, Karad for the use of human subjects in research. Informed consent was taken from all participants.

The subjects who were referred in wards and to physiotherapy department had been diagnosed by physicians of Krishna hospital, Karad, those who were diagnosed with incomplete spinal cord injury and falling in the inclusion criteria had been selected. Each of the subjects had been screened as per inclusion and exclusion criteria and they had been informed about the study and intervention. Before proceeding to intervention a written consent had been taken from them.

By using convenience sampling method subjects the participants were included in the study. The Study was done on total 40 subjects (30 males/10 females). Subjects were given structured exercise protocol where functional mobility exercises was given for upper limb and lower limb that included exercises with assistance followed by active exercises and then progressively with resistance. The intervention had been given for 12 weeks and treatment will be given 5 times a week

Pre and post tests were done using the outcome measures manual muscle testing for strength of muscle, functional independence measure scale and spinal cord independence measure for functional mobility in subjects with Incomplete spinal cord injury.

Statistical analysis: Statistical analysis of the recorded data was done by using the software Instat.Mean and standard deviation for each demographic variable were calculated. Data was calculated.MS Excel was used for drawing various graphs with given frequencies and for master chart.Unpaired t test was used to compare results of pre and post test.

Demographic variables:

1. DEMOGRAPHICS DATA AGE WISE DISTRIBUTION

AGE GROUP	NUMBER OF INDIVIDUALS
20-35yrs	**17**
36-51yrs	**18**
52-60yrs	**5**

2.GENDER WISE DISTRIBUTION

Sr. no	Gender distribution	Total
1	Male	30
2	Female	10
Total		40

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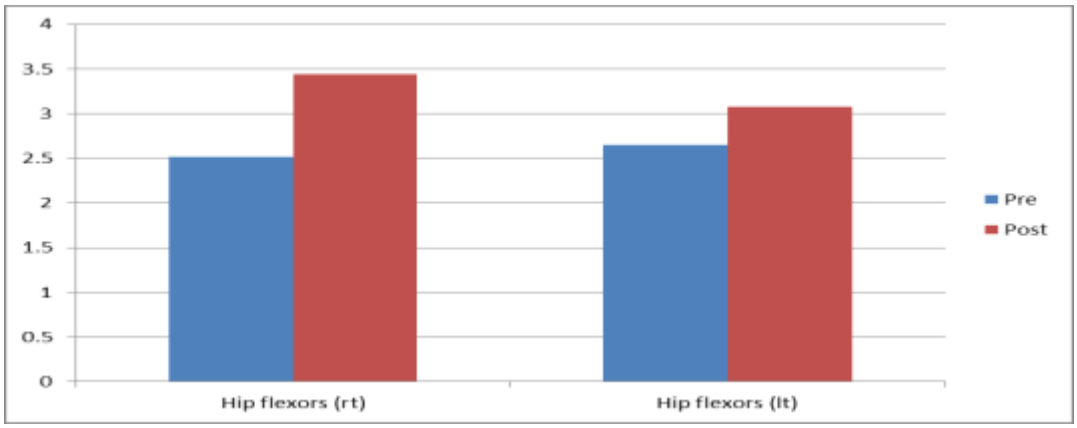
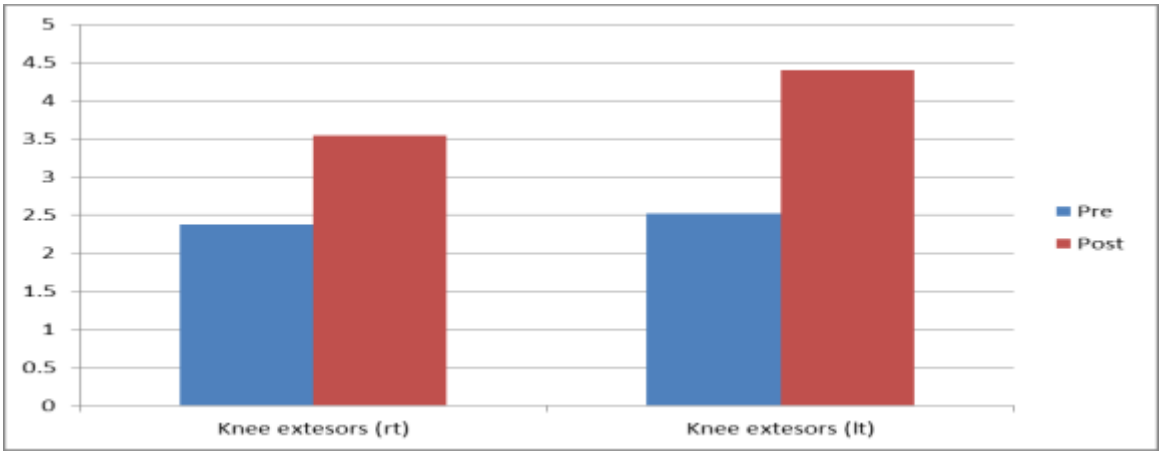
3.OUTCOME MEASURES

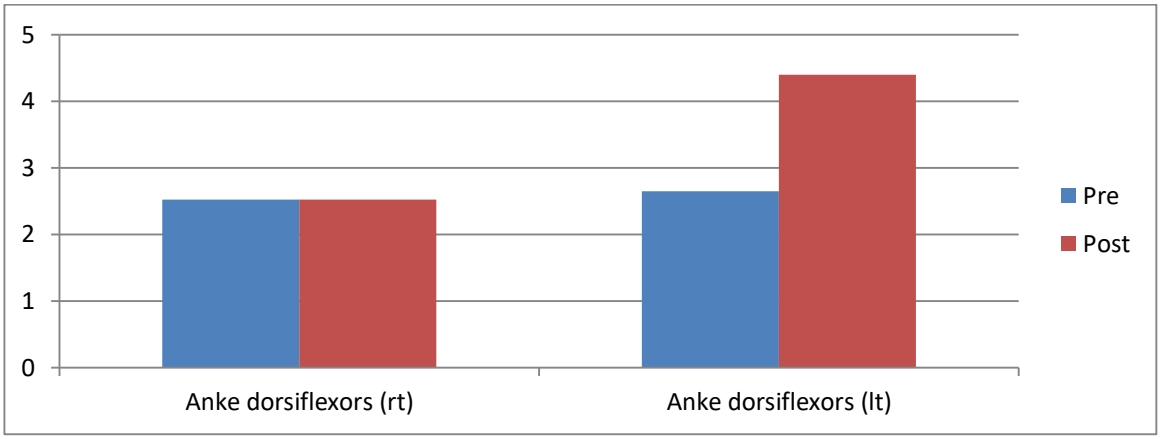
Outcome measures	**Pre-test Mean ± SD**		**Post-test Mean ± SD**		**p-value**	**Interpretations**
MMT						
right		left	right	Left		
1.Hip flexor	2.52±0.51	2.65±0.48	3.44±0.50	3.08±1.62	<0.0001	Extremely significant
2.Knee extensors	2.38±0.60	2.52±0.51	3.54±0.50	3.75±0.55		
3.Ankle dorsi flxors	2.52±0.51	2.65±0.48	2.52±0.51	2.79±2.14		
4.Long toe extensors	2.40±0.59	2.65±0.48	3.44±0.50	3.08±1.62		
5.Ankle plantar-flexors	2.42±0.60	2.60±0.50	3.52±0.51	3.81±0.58		
Scales						
1.FIM	74.26±8.05		96.92±8.04			
2.SCIM	37.34±5.08		67.65±6.84			



Comparison of pre and post intervention MMT of hip flexors.

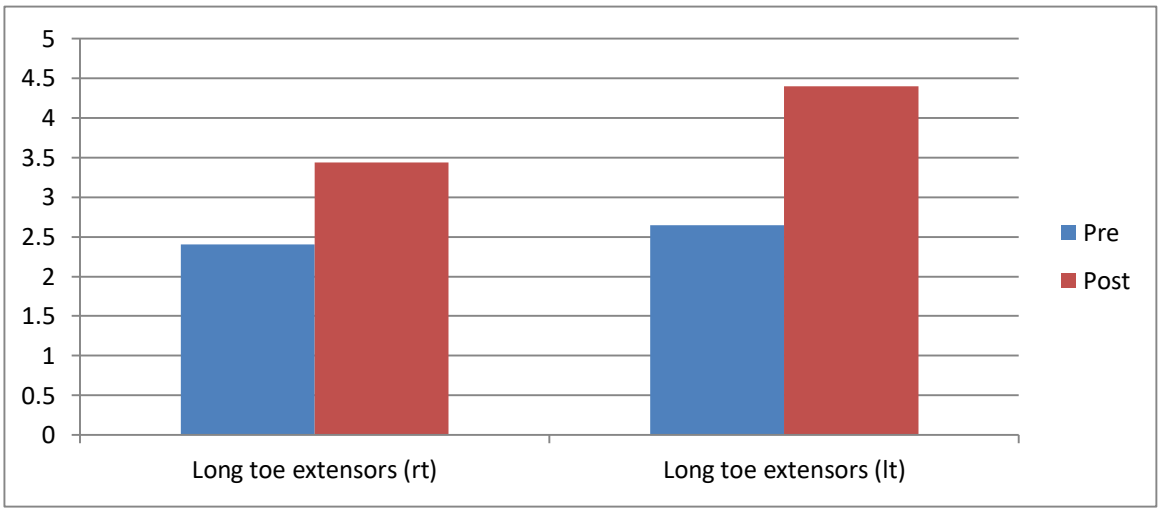


Comparison of pre and post intervention MMT of knee extensors



Comparision of per and post intervention MMT of ankle dorsiflexor

Comparision of per and post intervention MMT of long toe extensors



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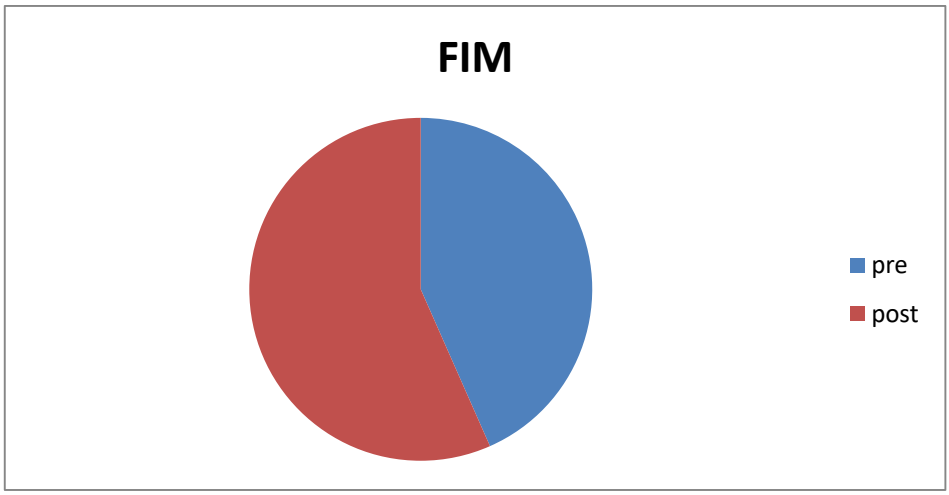
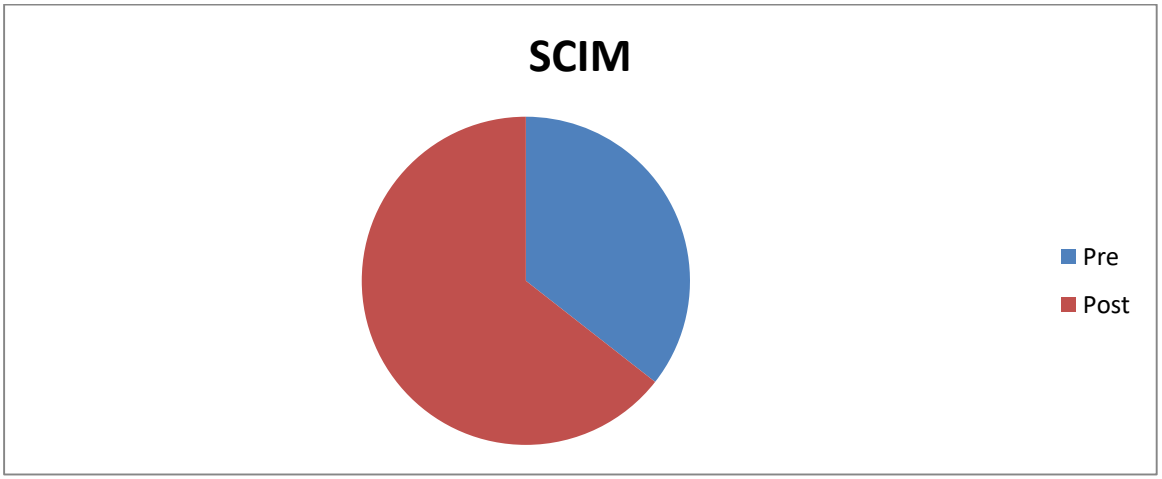
Comparision of per and post intervention MMT of ankle plantar flexors





Interpretation: Manual muscle testing shows extremely significant improvement in lower limb muscle strength with p value of 0.0001. Pre interventional value of mean and standard deviation for hip flexors was (2.52±0.51)(right), (2.65±0.48)(left) and post interventional value of mean and standard deviation was (3.44±0.50)(right), (3.08±1.62)(left) and also shows extremely significant improvement in hip flexor strength that is p value of <0.0001. Pre interventional value of mean and standard deviation for knee extensors was (2.38±0.60)(right), (2.52±0.51)(left) and post interventional value

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Spinal Cord Independence Measure scale shows extremely significant improvement with p value of 0.0001. Pre interventional value of mean and standard deviation was (37.34±5.08)and post interventional value of mean and standard deviation was (67.65±6.84).

Discussion: This study was conducted with 40 subjects. The subjects in Krishna hospital karad were screened and those fulfilling the inclusion criteria were involved in the study. Subjects were informed about the study and prior consent was taken. Individuals who had incomplete spinal cord injury with ASIA grade C and D were given this interventional protocol. Treatment should be given for 5 days a week for 12 weeks. The outcome measures for this study were Manual Muscle Testing (MMT), Functional Independence Measure(FIM), Spinal cord Independence Measure(SCIM). In incomplete spinal cord injury, sensory and motor functions below the neurological level and in the lower sacral segments are partially preserved.[1,2]

Patient's lack of mobility leads to development of secondary complications which include neurogenic bladder, urinary tract infection, pressure ulcers, orthostatic hypotension, fracture, deep vein thrombosis, spasticity, contracture, autonomic dysreflexia and depressive disorders.

Functional mobility is a person's physiological ability to move independently and safely in variety of environments in order to accomplish functional activities or task and to participate in the activities of daily living, at home, work and community.[7,8]

Symptoms usually peak in 2 to 4 week time period followed by a recovery period that can extend from week to months.[6]

Functional mobility training in rehabilitation improves performance through goal directed practice and repetition, which to address impairments and activity limitations.[13]

Evidence supports that if exercises and mobility training are not followed properly then there are chances of progress of the symptoms and may also worsen further. Which may lead to lack of mobility and permanent disability in incomplete paraplegic individuals.

Currently, evidence supporting the use of early functional mobility training in Spinal Cord Injury patients. Limited evidence suggests that early functional mobility improves functional mobility in Incomplete Paraplegic Individuals.

In the present study, sample size was 40 subjects. Out of which 30 were male and remaining 10 were female subjects. Prior consent was taken from them. The interventions were carried out for 5 days per week for 12 weeks. The outcome measures for this study was Manual muscle testing, Functional Independence Measure scale and Spinal Cord Independence Measure.

Functional mobility exercises were given which include exercises in bed, exercises in chair, exercises in parallel bars and then

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progressively increase the intensity of exercises.

Pre and post tests were done using the outcome measures for assessing muscle strength below the level of injury and functional mobility in incomplete paraplegic individuals.

Conclusion: This study concludes that functional mobility exercise 5 times a week is beneficial to improve the functional independence in incomplete paraplegic individuals. It also prevents secondary complications in the rehabilitation period and helps improve the quality of life.

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