Original Article

Study To Assess The Efficacy Of Proprioceptive Neuromuscular Facilitation On The Improvement Of Gait Among The Hemiplegic Patients In Tertiary Care Hospital, Bhubaneswar. - A Pilot Study

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Abstract

The proprioceptive neuromuscular facilitation (PNF) techniques such as contract-relax-antagonist-contract and contract-relax have been adopted by the researchers in the clinical area to investigate their efficacy on hemiplegic patient. This study investigated 4-week PNF exercise on the gait impaired hemiplegic participants measured with the Visual gait assessment scale- a 3 sectioned scale. Fourteen male and six female hemiplegic gait impaired participants (mean age 49.1 ± 7.8 years) were recruited into the study and treated for PNF protocol twice a day for 4 weeks. In the swing phase participants shows having decreased internal rotation (25%) and adduction (25%) and increased external rotation (47.5%) and abduction (42.5%) in hip and pelvis, normal knee movement (42.5%), and normal ankle/foot movement (12.5%) in the 4th week of intervention. In the stance phase, the participants show having decreased internal rotation (27.5%) and adduction (32.5%), increased external rotation (40%), abduction (42.5%) in hip and pelvis, normal knee movement (10%), normal ankle/foot movement (50%) in the 4th week of intervention. In the late stance phase, the participants show having decreased internal rotation (30%) and adduction (25%), increased external rotation (30%) and abduction (27.5%) in hip and pelvis, normal knee movement (32.5%) and normal ankle/foot movement (55%) in the 4th week of intervention. It has been seen, there is a significant change in excessive internal rotation, excessive external rotation, excessive abduction, excessive adduction, knee movement, and the ankle/foot movement i.e., p= <0.05. PNF exercise is an effective, easy to apply and potentially risk-free intervention for hemiplegic patients after stroke patients.

Key words: Stroke, hemiplegic patient, gait impairment, Proprioceptive neuromuscular facilitation exercise.

1. INTRODUCTION:

In both affluent and developing countries, people's lifestyles have changed considerably in recent decades. Industrialization, urbanisation, economic expansion, and market globalisation have resulted in rapid changes in diets and lifestyles, resulting in increasing health implications. While living conditions have improved and services have become more readily available, there have been significant negative consequences, such as bad eating habits, decreased in physical activities, and an increase in the diet-related chronic diseases. As a result, people are more likely to develop a range of chronic illnesses, the most common of which is stroke.[1]

Stroke is a disease in which the nerves of the brain are damaged. It is the fifth leading cause of death and the highest cause of disability in the United States. Stroke occurs when the blood vessel that carries oxygen and nutrients to the brain is blocked or broken (or broken). A portion of the brain is deprived of blood (and oxygen), and brain cells die as a result. Stroke is defined as the sudden onset of a focused neurologic deficit that lasts at least 24 hours and is thought to be caused by a vascular problem. Ischemic or hemorrhagic strokes are both possible. Focused ischemic neurologic impairments that persist less than 24 hours and frequently less than 30 minutes are known as transient ischemia episodes.[2]

Stroke is a worldwide health issue. It is the world's second leading cause of death and fourth leading cause of disability. Every year, around 20 million people will suffer a stroke, with 5 million of them dying. Stroke is a primary cause of functional disability, with 20% of survivors requiring institutional care and 15% to 30% of survivors having long-term impairment. [3]

According to the Global Burden of Disease Study, the annual incidence of stroke in India was 89 / 100,000 in 2005, rising to 91 / 100,000 in 2015 and 98 / 100,000 by 2030. India, where the average sex ratio is seven to one.[3] This may be due to gender differences in risk factors such as smoking and alcohol consumption, which are more common in Indian men than women.

According to the existing literature, earlier studies have focused irradiation of proprioceptive neuromuscular stimulation on the lower limb in stroke patients for extensor muscle force on the contralateral side. As a result, we must irradiate the proprioceptive neuromuscular facilitation effect, which is employed to enhance balance in stroke patients.[4]

2. METHODS:

2.1 Research design:

The research design used in this study was Randomized controlled trial- pilot study design.

Group	Pretest	Intervention	Posttest
Experimental group	O1	X	O2
Control group	O1	-	O2

Figure 2: Schematic representation of Randomized controlled trial design

CODES:

O1-Pretest gait level in the experimental and control groups Gait level
O2-Posttest in the experimental and control groups.
X-The experimental group was given proprioceptive neuromuscular facilitation exercises.

2.2. Study setting:

Present study setting was Pradyumna Bal Memorial Hospital, Bhubaneswar. In that, 4 wards of neurology department like-neuro surgery ICU, neuro HDU, neuro ward, neuro AC ward department were selected as experimental group and control group.

2.3. Population:

Samples included hemiplegic patients aged 31 - 60 years, performing the combined procedure at a designated hospital such as Pradyumna Bal Memorial Hospital, Bhubaneswar.

2.4. Sample:

Sample size was 40 people. Based on the combined procedure, 20 hemiplegic patients were in the experimental group and another 20 hemiplegic patients were in the control group. Research samples were selected using a process known as sequential samples.

2.5. Data gathering:

Section A: Demographic factors, including age, gender, educational attainment, occupation, BMI, bad habits, eating habits, and systemic sickness. Types of stroke, duration of stroke, stroke side effects, smoking and drinking habits, and more.
Section-B: Visual git assessment scale: A list of gait abnormalities that are commonly assessed visually was compiled and by consultation with three specialist physiotherapists who took no further part in the trial. This list was divided into three sections, described as follows,
Section A—General Characteristics of gait. This gives an overall view of the patient's gait.
Section B—Swing Phase: These analyses swing phase of hip, knee, and foot and ankle movement.
Section C—Stance Phase: Stance was broken down into early-, mid-, and late-stance. This level of detail was used because stance is believed to provide more information on gait quality than swing phase. [5]

2.6. Intervention and measures:

Out of 40, 20 hemiplegic participants in the experimental group were provided an exercise named proprioceptive neuromuscular facilitation exercise for 2times a day for the 4 weeks.

2.7. Ethical consideration:

The ethical permission has been taken from the IEC Committee, KIIT Deemed to be University, Bhubaneswar, Odisha. Inform consent has been taken from the participants.

RESULT:

Demographic data and the Visual gait assessment scale was analysed by using frequency and percentage distribution. Marginal Homogeneity Test, McNemar Test and chi-square tests were done to determine the efficacy of proprioceptive neuromuscular facilitation on improvement of gait.

Section-A:

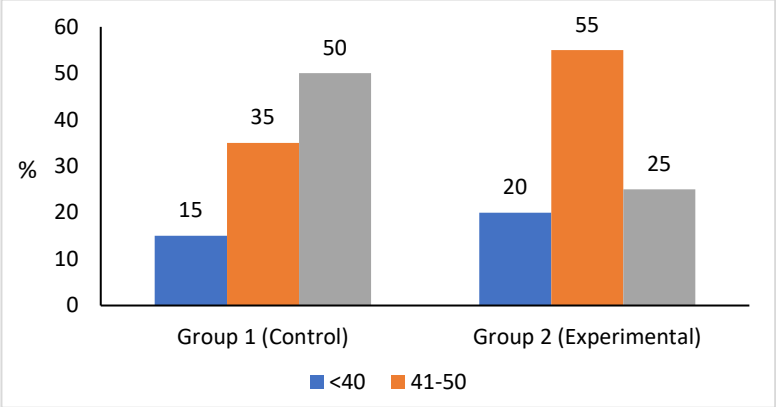
Section 1: Characteristics of socio-demographic data between experimental and control group.

This section deals with the demographical characteristics of the respondents. The data pertaining to the demographic variables of respondents inside age, gender, educational qualification, professional activities, dietary habits, Body mass index, systemic illness, type of stroke, side affected with stroke, alcoholic habit, smoking habit.

Table No-1.1 Frequency and Percentage distribution of Age in control & experimental group.

	Control group(n=20)		Experimental (n=20)	
Age (in years)	**Frequency**	**%**	**Frequency**	**%**
<40	3	15	4	20
41-50	7	35	11	55
51+	10	50	5	25

The above table shows that out of 40 cases maximum participants belongs to the age group of 41-50 years i.e., 11(55%) and minimum age group were <40 years i.e., 4(20%) in the experimental and in control group maximum age group 51+ years of age i.e., 10(50%) and minimum age group were <40 years of age i.e., 3(15%).

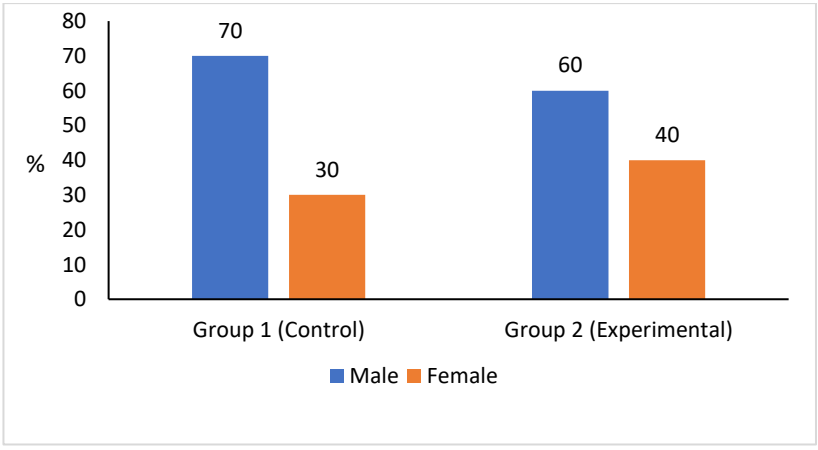


Graph no. 1- Graphical presentation of bars diagram showing percentage wise distribution according to Age of the hemiplegic patients.

TableNo-1.2 Frequency and Percentage distribution of Gender in control & experimental group.

	Control group(n=20)		Experimental (n=20)	
Gender	**Frequency**	**%**	**Frequency**	**%**
Male	14	70	12	60
Female	6	30	8	40

Table 1.2 shows that frequencies of gender where male between control and experimental group are 14(70%), 12(60%) respectively and female between control and experimental group are 6(30%), 8(40%) respectively.

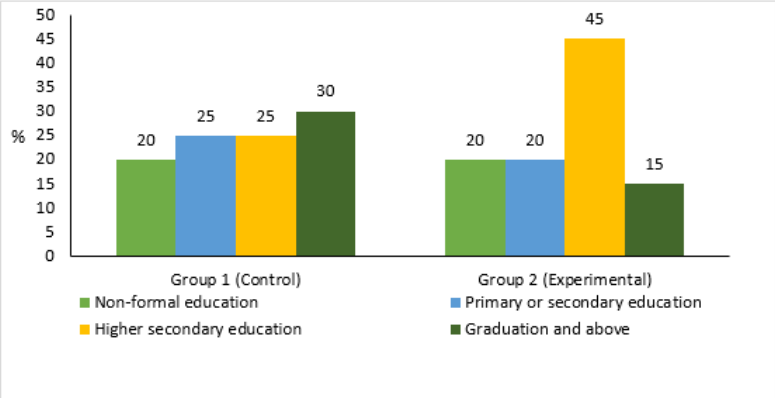


Graph no. 2- Graphical presentation of bars diagram showing percentage wise distribution according to Gender of the hemiplegic patients.

Table 1.3: Frequency and Percentage distribution of Educational qualification in control & experimental group.

	Control group(n=20)		Experimental(n=20)	
Educational qualification	**Frequency**	**%**	**Frequency**	**%**
Non-formal education	4	20	4	20
Primary or secondary education	5	25	4	20
Higher secondary education	5	25	9	45
Graduation and above	6	30	3	15

Table 1.3 shows that frequency and percentage of education qualification of the patients in control and experimental group. Maximum of patients are having higher secondary education i.e., 9(45%) in experimental group and maximum participants were having graduation and above i.e., 6(30%). Minimum patients were having non- formal education in both experimental and control group i.e., 4(20%) respectively.

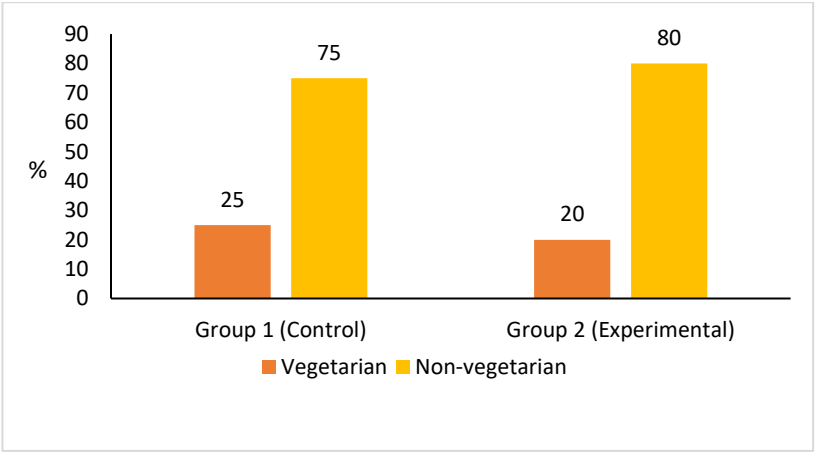


Graph no. 3- Graphical presentation of bars diagram showing percentage wise distribution according to Educational qualification of the hemiplegic patients.

Table 1.4 Frequency and Percentage distribution of Dietary habit in control & experimental group

	Control group(n=20)		Experimental(n=20)	
Dietary habit	**Frequency**	**%**	**Frequency**	**%**
Vegetarian	5	25	4	20
Non-vegetarian	15	75	16	80

The above table shows that frequency and percentage of dietary habit of the participants in experimental and control group. Maximum patients were non-vegetarians in both experimental and control group i.e., 16(80%), 15(75%) respectively and minimum participants were vegetarians i.e., 5(25%), 4(20%) respectively.

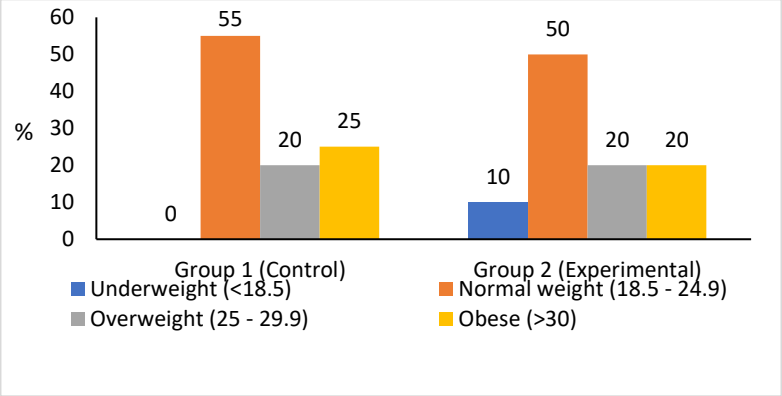


Graph no. 4- Graphical presentation of bars diagram showing percentage wise distribution according to Dietary habit of the hemiplegic patients.

Table 1.5 Frequency and percentage distribution of Body Mass Index in control & experimental group

	Control group(n=20)		Experimental(n=20)	
BMI	**Frequency**	**%**	**Frequency**	**%**
Underweight (<18.5)	0	0	2	10
Normal weight (18.5 - 24.9)	11	55	10	50
Overweight (25 - 29.9)	4	20	4	20
Obese (>30)	5	25	4	20

The above table shows the frequency and percentage of body mass index in experimental and control group. Maximum participants were having normal weight i.e., 11(55%), 10(50%) in control and experimental group respectively. Minimum participants were having underweight 2(10%) in experimental group.

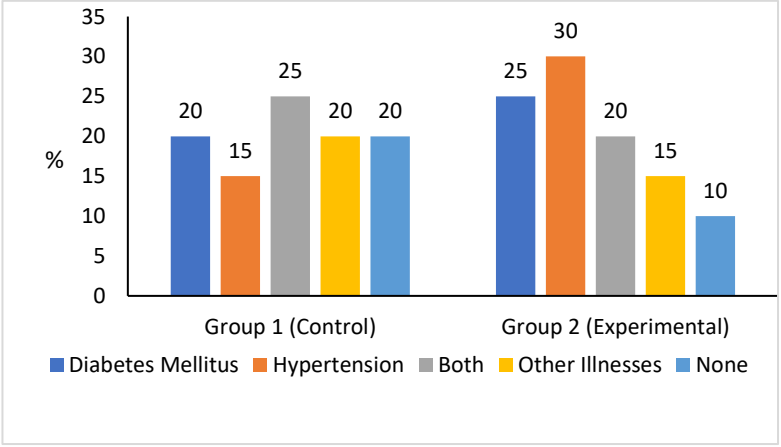


Graph no. 5- Graphical presentation of bars diagram showing percentage wise distribution according to Body Mass Index of the hemiplegic patients.

Table 1.6 Frequency and Percentage distribution of Systematic illness in control & experimental group

	Control group(n=20)		Experimental(n=20)	
Systematic illness	**Frequency**	**%**	**Frequency**	**%**
Diabetes Mellitus	4	20	5	25
Hypertension	3	15	6	30
Both	5	25	4	20
Other Illnesses	4	20	3	15
None	4	20	2	10

Table no1.6 shows that maximum participant were having hypertension 6(30%) in the experimental group and both hypertension and diabetes 5(25%) in control group. Minimum participants were having none 2(10%) in the experimental group and hypertension 3(15%) in control group.

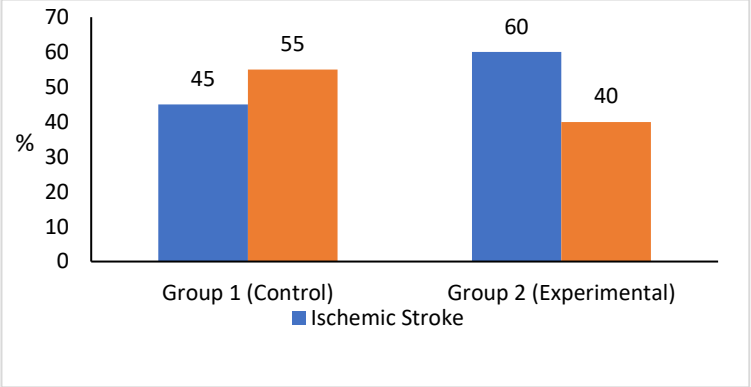


Graph no. 6- Graphical presentation of bars diagram showing percentage wise distribution according to Systematic illness of the hemiplegic patients.

Table 1.7 Frequency and percentage distribution of Type of stroke in control & experimental group

	Control group(n=20)		Experimental (n=20)	
Type of stroke	**Frequency**	**%**	**Frequency**	**%**
Ischemic Stroke	11	55	12	60
Haemorrhagic Stroke	9	45	8	40

Table no 1.7 shows that maximum number of participants were having ischemic stroke in both experimental and control group i.e., 11(55%), 12(60%) respectively and minimum participants were having haemorrhagic stroke i.e., 9(45%), 8(40%) respectively.

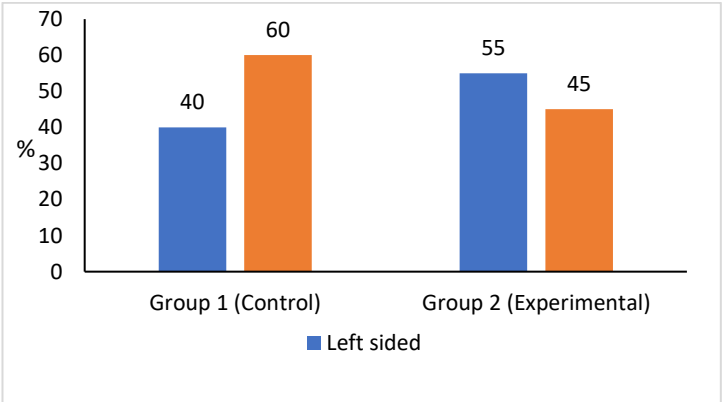


Graph no. 7- Graphical presentation of bars diagram showing percentage wise distribution according to Types of stroke of the hemiplegic patients.

Table 1.8 Frequency and Percentage distribution of Side affected in stroke in control & experimental group

	Control group(n=20)		Experimental(n=20)	
Side affected in stroke	**Frequency**	**%**	**Frequency**	**%**
Left sided	8	40	9	45
Right sided	12	60	11	55

The above table shows that frequency and percentage of side affected with stroke. Maximum participants were having right sided stroke in both experimental and control group i.e., 11(55%), 12(60%) respectively. Minimum participants were having left sided stroke in both experimental and control group i.e., 8(40%), 9(45%) respectively.

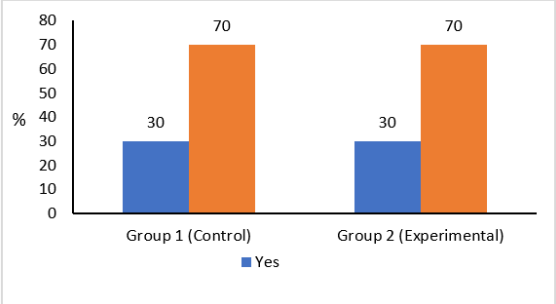


Graph no. 8- Graphical presentation of bars diagram showing percentage wise distribution according to Side affected with stroke of the hemiplegic patients.

Table 1.9 Frequency and Percentage distribution of Alcoholic habit in control & experimental group

	Control group(n=20)		Experimental(n=20)	
Alcoholic habit	**Frequency**	**%**	**Frequency**	**%**
Yes	6	30	6	30
No	14	70	14	70

The above table shows that maximum participants were not having alcoholic habit i.e., 14(70%) in both experimental and control group respectively.

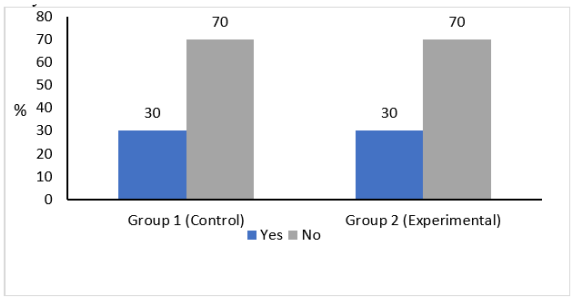


Graph no. 9- Graphical presentation of bars diagram showing percentage wise distribution according to Types of stroke of the hemiplegic patients.

Table 1.10 Frequency and Percentage distribution of Smoking habit in control & experimental group

	Control group(n=20)		Experimental(n=20)	
Smoking habit	**Frequency**	**%**	**Frequency**	**%**
Yes	6	30	6	30
No	14	70	14	70

The above table shows that maximum participants were not having smoking habit i.e., 14(70%) in both experimental and control group respectively.



Graph no. 10- Graphical presentation of bars diagram showing percentage wise distribution according to Types of stroke of the hemiplegic patients.

Section-B:

Table-1: Marginal Homogeneity Test, McNemar Test to determine the pre- and post-intervention level of gait among hemiplegic patients in experimental and control group.

Table 1.1 Comparison of swing phase among pre-test, post-test 2 and 4 week				
	Experimental group(n=20)		Control group(n=20)	
	Pre-test	Post-test (4 week)	Pre-test	Post-test (4 week)
	n(%)	n(%)	n(%)	n(%)
HIP and pelvis				
Normal	0(0%)	4(20%)	0(0%)	0(0%)
Hitching	20(100%)	10(50%)	7(35%)	10(50%)
Retracted	5(25%)	2(10%)	5(25%)	6(30%)
Circumduction	7(35%)	10(50%)	7(35%)	7(35%)
Excessive internal rotation	9(45%)	1(5%)	9(45%)	9(45%)
Excessive abduction	0(0%)	13(65%)	0(0%)	4(20%)
Excessive flexion	0(0%)	2(10%)	3(15%)	3(15%)
Excessive external	0(0%)	13(65%)	1(5%)	6(30%)
Excessive adduction	11(55%)	1(5%)	12(60%)	9(45%)
Excessive extension	3(15%)	3(15%)	7(35%)	6(30%)
Knee				
Normal	3(15%)	12(60%)	5(25%)	5(25%)
Mainly excessive extension	9(45%)	0(0%)	13(65%)	11(55%)
Mainly excessive flexion	0(0%)	8(40%)	0(0%)	2(10%)
Overall lack of movement	8(40%)	0(0%)	2(10%)	2(10%)
Ankle/Foot				
Normal	1(5%)	4(20%)	0(0%)	1(5%)
Poor foot/floor clearance	15(75%)	0(0%)	6(30%)	4(20%)
Excessive inversion	1(5%)	1(5%)	11(55%)	8(40%)
Excessive plantarflexion	3(15%)	0(0%)	3(15%)	2(10%)
Excessive eversion	0(0%)	7(35%)	0(0%)	2(10%)
Excessive dorsiflexion	0(0%)	8(40%)	0(0%)	3(15%)

Table 1.2 Comparison of stance phase among pre-test, post-test 2 and 4 week				
	Experimental group(n=20)		Control group(n=20)	
	Pre-test	Post-test (4 week)	Pre-test	Post-test (4 week)
	n (%)	n(%)	n(%)	n(%)
HIP and pelvis				
Normal	0(0%)	4(20%)	0(0%)	0(0%)
Retracted	12(60%)	7(35%)	2(10%)	4(20%)
General instability	10(50%)	1(5%)	12(60%)	8(40%)
Excessive internal rotation	8(40%)	1(5%)	8(40%)	10(50%)
Excessive abduction	0(0%)	14(70%)	0(0%)	3(15%)
Excessive flexion	0(0%)	0(0%)	0(0%)	0(0%)
Excessive external rotation	0(0%)	13(65%)	0(0%)	3(15%)
Excessive adduction	7(35%)	2(10%)	12(60%)	11(55%)
Knee				
Normal	15(75%)	0(0%)	18(90%)	16(80%)
Excessive extension	0(0%)	11(55%)	0(0%)	2(10%)
Excessive flexion	0(0%)	0(0%)	0(0%)	0(0%)
Ankle/Foot initial contact				
Normal	4(20%)	18(90%)	2(10%)	2(10%)
Abnormal	16(80%)	2(10%)	18(90%)	18(90%)

Table 1.3 Comparison of late stance phase among pre-test, post-test 2 and 4 week				
	Experimental group(n=20)		Control group(n=20)	
	Pre-test	Post-test (4 week)	Pre-test	Post-test (4 week)
	n(%)	n(%)	n(%)	n(%)
HIP and pelvis				
Normal	0(0%)	4(20%)	0(0%)	0(0%)
Retracted	7(35%)	4(20%)	7(35%)	7(35%)
General instability	12(60%)	1(5%)	11(55%)	11(55%)
Excessive internal rotation	4(20%)	3(15%)	9(45%)	9(45%)
Excessive abduction	0(0%)	11(55%)	0(0%)	0(0%)
Excessive flexion	0(0%)	1(5%)	0(0%)	0(0%)
Excessive external rotation	0(0%)	12(60%)	0(0%)	0(0%)
Excessive adduction	6(30%)	1(5%)	9(45%)	9(45%)
Knee				
Normal	6(30%)	11(55%)	2(10%)	2(10%)
Excessive extension	14(70%)	0(0%)	18(90%)	17(85%)
Excessive flexion	0(0%)	9(45%)	0(0%)	1(5%)
Ankle/Foot final contact				
Normal	4(20%)	20(100%)	2(10%)	2(10%)
Abnormal	16(80%)	0(0%)	18(90%)	18(90%)

Table-2: Chi-square to determine the efficacy of Proprioceptive neuromuscular facilitation for reducing disability among hemiplegic patients and also to find out the efficacy of Proprioceptive neuromuscular facilitation on contralateral lower extremity on balance in hemiplegic patients.

Table 2.1 Association of Swing phase at post-test 4 weeks with groups					
HIP and pelvis	Group 1 (Control) (n=20)		Group 2 (Experimental) (n=20)		Chi-Square 'p' value
	No.	%	No.	%	
Normal	0	0	4	20	0.035*
Hitching	10	50	10	50	1.000
Retracted	6	30	2	10	0.114
Circumduction	7	35	10	50	0.337
Excessive internal rotation	9	45	1	5	0.003*
Excessive abduction	4	20	13	65	0.004*
Excessive flexion	3	15	2	10	0.633
Excessive external rotation	6	30	13	65	0.027*
Excessive adduction	9	45	1	5	0.003*
Excessive extension	6	30	3	15	0.256
Knee					
Normal	5	25	12	60	<0.001*
Mainly excessive extension	11	55	0	0	
Mainly excessive flexion	2	10	8	40	
Overall lack of movement	2	10	0	0	
Ankle/Foot					
Normal	1	5	4	20	0.003*
Poor foot/floor clearance	4	20	0	0	
Excessive inversion	8	40	1	5	
Excessive plantarflexion	2	10	0	0	
Excessive eversion	2	10	7	35	
Excessive dorsiflexion	3	15	8	40	

Note * statistically significant (p<0.05)

Table 2.2 Association of Stance phase at post-test 4 weeks with groups					
HIP and pelvis	Group 1 (Control) (n=20)		Group 2 (Experimental) (n=20)		Chi-Square 'p' value
	No.	%	No.	%	
Normal	0	0	4	20	0.035
Retracted	4	20	7	35	0.288
General instability	8	40	1	5	0.008*
Excessive internal rotation	10	50	1	5	0.001*
Excessive abduction	3	15	14	70	<0.001*
Excessive flexion	0	0	0	0	-------
Excessive external rotation	3	15	13	65	0.001*
Excessive adduction	11	55	2	10	0.002*
Knee					
Normal	0	0	4	20	0.035*
Retracted	4	20	7	35	0.288
Ankle/Foot initial contact					
Normal	2	10	18	90	<0.001*
Abnormal	18	90	2	10	

Note * statistically significant (p<0.05)

Table 3.3 Association of Late stance phase at post-test 4 weeks with groups					
HIP and pelvis	Group 1 (Control) (n=20)		Group 2 (Experimental) (n=20)		Chi-Square 'p' value
	No.	%	No.	%	
Normal	0	0	4	20	0.035*
Retracted	7	35	4	20	0.288
General instability	11	55	1	5	0.001*
Excessive internal rotation	9	45	3	15	0.038*
Excessive abduction	0	0	11	55	<0.001*
Excessive flexion	0	0	1	5	0.311
Excessive external rotation	0	0	12	60	<0.001*
Excessive adduction	9	45	1	5	0.003*
Knee					
Normal	2	10	11	55	<0.001*
Excessive extension	17	85	0	0	
Excessive flexion	1	5	9	45	
Ankle/Foot final contact					
Normal	2	10	20	100	<0.001*
Abnormal	18	90	0	0	

Note * statistically significant (p<0.05)

RESULTS:

Table-1 shows as follows,

- In the swing phase to start with hip and pelvis movement excessive internal rotation (5%) and excessive adduction (5%) reduces and excessively external rotation (65%) and excessively abduction (65%) increases. Then, in knee movement normal (60%) knee movement of the participant increases in the post test as compare to pre-test. In the end the ankle/ foot movement is normal (20%).
- In the stance phase to start with hip and pelvis movement excessive internal rotation (5%) and excessive adduction (10%) reduces and excessively external rotation (65%) and excessively abduction (70%) increases. Then, ankle/ foot initial contact movement the normal (90%) of the participant increases in the post test as compare to pre-test.
- In the late stance phase to start with hip and pelvis movement excessive internal rotation (15%) and excessive adduction (5%) reduces and excessively external rotation (60%) and excessively abduction (55%) increases. Then, in knee movement normal (55%) knee movement of the participant increases in the post test as compare to pre-test. In the end the ankle/ foot final contact is normal (100%).

Table-2 shows as follows,

- In the swing phase firstly, in hip and pelvis movement normal movement, excessive internal rotation, excessive external rotation, excessive adduction and excessive abduction, are high proportionate with each other i.e., p=<0.05, that means they are significant. The knee at swing phase, Normal and Mainly excessive flexion were found significantly higher proportion in experimental group (p=0.000). Ankle/Foot in swing phase, Normal, Excessive eversion and Excessive dorsiflexion were found significantly higher proportion in experimental group (p=0.003)
- Stance phase at post-test 4 week with groups. HIP and pelvis, normal, Excessive abduction and Excessive external rotation were significantly higher proportion in experimental group than control group (p<0.05). In the knee functions, out of 40 cases, 11 (27.5%) cases were knee, 16 (40.0%) were normal, 13 (32.5%) were excessive extension and none of the cases were excessive flexion. Normal was significantly higher proportion in control group than experimental group (p=0.000). Ankle/Foot initial contact, in control group 2 (10%) cases were normal and corresponding proportion in experiment group i.e., 18 (90%). There was significantly higher proportion of normal cases in experimental group than control group (p=0.000).
- Late stance phase at post-test 4 weeks with groups. Components of HIP and pelvis like Normal, Excessive abduction and Excessive external rotation were significantly higher proportion in experimental group than control group (p<0.05). Knee, Excessive extension was significantly higher proportion in control group (p=0.000). Ankle/Foot, 2 (10%) cases were normal in control group and corresponding in experimental group i.e., 20 (100%). Difference was found significant (p=0.000).

DISCUSSION:

Findings related to characteristics of socio-demographic variable:

- Out of 40 cases 17.5% belonged to less than 40 years age group, 45% to 41-50 years age group and 37.5% to 51 or more years. The mean age is 49.1 ± 7.8 years. There is no significant association between age and groups (p= 0.259).
- Male female constituted 65% and 35% respectively and does not have significant association with the groups (p= 0.507).
- Nearly a quarter of the respondents (22.5%) were graduate and above, 35% with higher secondary education, 22.5% primary or secondary education and 20% non-formal education. There is no significant association between educational qualification and groups (p=0.521). The majority of the respondents 77.5% were non-vegetarian. There is no significant association between dietary habits and groups (p=0.705).
- A little more than half (52.1%) were normal weight, 20% overweight, and 22.5% obese and only 5% were underweight. BMI does not have significant association with groups (p= 0.540).
- It is found that 22.5% each had systematic illness like diabetes mellitus, hypertension, both DM & hypertension and 17.5 had other illness. There was no significant between systematic illness and groups (p=0.730).
- A little more than half (52.5%) had ischemic stroke and 47.5% had haemorrhagic stroke. There was no significant between type of stroke and groups (p=0.342).
- Majority (70.0%) did not have alcoholic habit and only 30% did not have. Alcoholic habit and group did not have significant association (p=1.00).

To assess the pre- and post-intervention level of gait among hemiplegic patients in experimental and control group:

- In hip and the pelvis changes in the swing phase all the cases presented with Hitching hip and pelvis during pre-test and that reduced to 95% at post-test two weeks(p=1.000) and further reduced to 50% at post-test 4 weeks.
- At pre-test no cases presented with excessive external rotation of HIP and pelvis which increased to 12% at post-test two weeks (p=0.000) and further increased to 65% at post-test 4 weeks (p=0.000). The improvement between pre-test & post-test 2 weeks and pre-test & post-test 4 weeks was found significant.
- At pre-test 11 (55%) cases presented with excessive adduction which reduced to 20% at post-test two weeks (p=0.016) and further reduced to 5% at post-test 4 weeks (p=0.002). The improvement between pre-test & post-test 2 weeks and pre-test & post-test 4 weeks was found significant.
- At pre-test no cases presented with excessive abduction which increased to 60% at post-test two weeks (p=0.000) and further increased to 65% at post-test 4 weeks (p=0.000). The change between pre-test & post-test 2 weeks and pre-test & post-test 4 weeks was found significant.
- The characteristics of Knee movement was normal for 15% cases at the pre-test, remained so at pre-test 2 weeks. At post-test 4 weeks the movement was normal for 60% cases.
- Characteristic features of Ankle/ foot movement showed significant improvement at post-test 2 weeks (p= 0.000) and post-test 4 weeks over pre-test period. At pretest only 1 case was normal, it became 4 in post-test 4 weeks. Poor foot/ floor clearance was 75% at pre-test that significantly reduced to 15% at post-test 2 weeks and 0% at post-test 4 weeks.
- In the stance phase all the parameters of HIP and pelvis did not show significant change between posttest 2 & 4 weeks (p>0.05). There is significant improvement in general instability, excessive internal rotation, excessive abduction, excessive external rotation at post-test 2 weeks (p <0.05) and at post-test 4 weeks (p < 0.05).
- Similarly in the stance phase of Knee movement, experienced significant improvement at post-test 2 weeks (p=0.011), but no significant change in pretest with post-test 2 weeks and posttest 2 weeks with posttest 4 weeks (p>0.05).
- Ankle foot initial contact was normal for 4 (20%) cases at pre-test, that increased to 13 (65%) cases at post-test 2

weeks and 18 (90%) at post-test 4 weeks, registering significant improvement with p= 0.004 at post-test 2 week and p= 0.000 at post-test 4 weeks. But in posttest 2 & 4 weeks did not show significant difference (p=0.063).

- The HIP and pelvis motion features like general instability, excessive abduction and excessive external rotation have register significant change between pre-test & post-test 2 weeks and pre-test & post-test 4 weeks ($p<0.05$) in the experimental group. The general instability at pre-test was among 60% cases which reduced to 5% at post-test 4 weeks. Excessive abduction which was 0% at pre-test increased to 55% at post-test 4 weeks. Excessive external rotation which was 0% at pre-test increased to 60% at post-test 4 weeks.
- The knee movement at stance phase did not have significant change between pre-test & post-test at 2 week (p=0.052), pre-test & post-test at 4 weeks (p=0.346) in the experimental group.
- Ankle/foot final contact in stance phase exhibited significant change between pre-test & post-test at 2 week (p=0.002), pre-test & post-test at 4 week (p=0.000) and posttest 2 & 4 weeks (p=0.031) in the experimental group.
- The study findings are supported by another study found that in the Department of Neuro Rehabilitation in Italy, 10 healthy participants and 56 hemiplegic patients with hemiplegic stroke for more than 12 months were regularly admitted to a rehabilitation centre. Patients were videotaped in slow motion. Video recording activities when received and at the end of the retraining training period were used to obtain quantitative metrics and clinical gait metrics. The Wisconsin Gait Scale was used to assess quality features. The Wisconsin Gait Scale Middle School improved significantly after training. The "weight change on the paretic side" and the patterns during the flexion phase of the traumatized leg are particularly improved. The number of steps, the walking time, and the standing time of the unaffected side increased significantly, although the speed of movement and length decreased significantly.[6]

To find out the efficacy of Proprioceptive neuromuscular facilitation for reducing disability among hemiplegic patients.

- Association of swing phase at post-test 4 weeks with groups that shows ten components of HIP and pelvis were analyzed. Among these five components i.e., Hitching, Retracted, Circumduction, Excessive flexion and Excessive extension did not show significant association with groups ($p>0.05$). But in normal, Excessive abduction and Excessive external rotation were found significantly higher proportion in experimental group ($p<0.05$). Similarly Excessive internal rotation and Excessive adduction were found significantly higher proportion in control group ($p<0.05$).
- The knee at swing phase, Normal and Mainly excessive flexion were found significantly higher proportion in experimental group (p=0.000).
- Ankle/Foot in swing phase, Normal, Excessive eversion and Excessive dorsiflexion were found significantly higher proportion in experimental group (p=0.003).
- Association of stance phase at posttest 4 week with groups shows HIP and pelvis, normal, Excessive abduction and Excessive external rotation were significantly higher proportion in experimental group than control group ($p<0.05$). Similarly General instability, Excessive internal rotation and Excessive adduction were significantly higher proportion in control group than experimental group ($p<0.05$).
- In the knee functions, out of 40 cases, 11 (27.5%) cases were knee, 16 (40.0%) were normal, 13 (32.5%) were excessive extension and none of the cases were excessive flexion. Normal was significantly higher proportion in control group than experimental group (p=0.000).
- Ankle/Foot initial contact, in control group 2 (10%) cases were normal and corresponding proportion in experiment group i.e., 18 (90%). There was significantly higher proportion of normal cases in experimental group than control group (p=0.000).
- Association of Late stance phase at posttest 4 weeks with groups shows Components of HIP and pelvis like Normal, Excessive abduction and Excessive external rotation were significantly higher proportion in experimental group than control group ($p<0.05$). Similarly in General instability, Excessive internal rotation and Excessive adduction were significantly higher proportion in control group than experimental group ($p<0.05$). But in Retracted and Excessive flexion did not have any significant association with groups ($p>0.05$).
- Knee, Excessive extension was significantly higher proportion in control group (p=0.000).
- Ankle/Foot, 2 (10%) cases were normal in control group and corresponding in experimental group i.e., 20 (100%). Difference was found significant (p=0.000).
- The above result is based on a single, randomized, controlled multicenter randomized controlled trial to show that neuromuscular proprioceptive control improves the mobility of hemiplegic patients. A total of 100 patients were randomly assigned to one of two groups: a study group receiving additional proprioceptive neuromuscular facilitation treatment, or a control group who did not receive additional treatment. The intervention was performed over a period of six weeks. The degree of damage was assessed using the Brunnström-Fugl-Meyer test. The Brunnström-Fugl-Meyer study showed that patients in the study group performed better than those in the control group.[7]

CONCLUSION:

The effectiveness of proprioceptive neuromuscular stimulation in improving the mobility of patients with hemiplegia has been investigated in this study. The experimental group step improved significantly after using proprioceptive neuromuscular facilitation, according to the findings. The researcher concluded that proprioceptive neuromuscular

facilitation exercise has a significant effect on the hemiplegic gait based on the findings of the study. After a stroke, patients with hemiplegic can benefit from neuromuscular facilitation exercise, which is a simple, effective, and potentially dangerous procedure.

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