

Original Research Article

Early PNF exercises functional outcome and quality in patients with stroke of urban and rural area in Uttar Pradesh: a prospective community based study

Ajai Kumar Singh, Poonam Chaturvedi*, Pradeep K. Maurya, Dinkar Kulshreshtha, Abdul Qavi, Anup Thacker

Department of Neurology, Dr. Ram Manohar Lohia Institute of Medical Sciences, Lucknow, Uttar Pradesh, India

Received: 01 December 2017

Accepted: 30 December 2017

*Correspondence:

Dr. Poonam Chaturvedi,

E-mail: poonamchaturvediphysio@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Early rehabilitation plays a very important role in stroke outcome. In India people from rural areas get primary treatment from district hospitals, where the rehabilitation facilities are not available, and then referred to the tertiary care hospital (after 2-3weeks) hence the rehabilitation process is delayed. It may delay the improvement in functional outcome and quality of life. These factors should be evaluated. To evaluate effects of PNF intervention in urban and rural population in Uttar Pradesh.

Methods: Total 90 patients were recruited in this study and divided into rural (coming from rural areas of Uttar Pradesh) and urban (coming from urban areas) groups. Patients were given rehabilitation for 4weeks and improvement in functional activities was assessed by Barthel's-Index (BI), Quality of Life was assessed by Stroke Specific Quality of Life Scale (SSQOL) and sensory motor improvement was assessed by Fugl- Meyer Assessment before and after the intervention. Patients were again assessed at 6months.

Results: 41 patients in experimental and 49 patients in control group completed the 6 months follow up and were available for analysis. On analysis urban group showed better (<0.05) improvement in functional activities, sensory motor improvement (FMA) and quality of life (SSQOL) as well. People who directly admitted to our multispecialty and tertiary care hospital and received early rehabilitation showed better improvement than the patients who received late rehabilitation.

Conclusions: Early rehabilitation leads to early improvement in functional activities. PNF exercises are very effective in improving motor function and should be given from the first day after stroke.

Keywords: Barthel's- Index, Early Rehabilitation, Quality of Life, Stroke, Urban

INTRODUCTION

Stroke is the most common neurological problem in the world and it affects every aspect of life such as difficulty in performing functional activities and quality of life. Quality of life is defined as the multi-dimensional evaluation of physical, psychological, social and environmental aspect.¹ Despite the progress made during

inpatient rehabilitation, approximately 33% of stroke survivors still have deficits requiring additional rehabilitation in the community. The inability to access health care services may affect recovery and may result in poor declining cognition, quality of life and increased risk of medical complication.² A variety of neurologically based techniques are used by physical therapists in the treatment of hemiplegic patients. Although these techniques are used widely, few studies have been

reported in the literature validating these diverse approaches for specific conditions or problems. Proprioceptive neuromuscular facilitation (PNF) is a philosophy of treatment based on principles of neurophysiology.

The principles of PNF were explained first by Kabat based on Sherrington's work in muscle and nerve physiology. Kabat suggested that patterns of movements performed in combination with other facilitatory procedures result in enhanced voluntary responses. The PNF approach to treatment uses the principle (based on early phylogenetic and embryologic observations that control of motion proceeds from proximal to distal body regions. Facilitation of trunk control, therefore, is used to influence the extremities.³⁻⁸ In our study we have used this principle with the hypothesis that if we resist proximal muscles, there is spread of the activity in the surrounding muscles called irradiation effect.

We tried to apply this principle in acute stage of stroke with the hypothesis that by applying resistance to the proximal muscles, giving traction and approximation to the joint and by using stretch reflex at the end of each pattern, we can generate response in weak and paralyzed distal muscles. Once the tone is improved this will help in improvement in functional activities and hence quality of life.

METHODS

Subjects

In this study total 90 patients were recruited who came from different cities and areas of Uttar Pradesh and admitted to general ward of department of neurology in Dr. Ram Manohar Lohia Institute of Medical Sciences, Lucknow. All the patients gave their consent in the written form to participate in the study. The study was approved by institutional ethical committee. Patient included in the study according to the inclusion criteria i.e. patients having 1) first time stroke 2) age 40-70years, Exclusion criteria was 1) recurrent stroke 2) severe cardiac illness (MI) 3) fracture 4) pregnancy 5) NIHSS > 20 6) MMSE < 19 7) any psychiatric illness 8) subarachnoid hemorrhage 9) amputation.

Definition of rural and urban

We defined Urban and rural area as: constituents of urban area all places with municipality, corporation, cantonment board or notified town area committee etc. and Places where minimum population of 5000, 75% of main male population is engaged in nonagricultural pursuits, a density of population of at least 400 per sq. km.

Rural: All area other than urban is rural. The basic unit for rural area is revenue village.⁹

Patients were recruited from June 2015 to December 2016. Baseline data such as National institute of Health Stroke Scale (NIHSS), Modified Rankin Scale (MRS), Barthel's-Index (BI) were recorded within 48 hours from the day of admission. Patients were given rehabilitation 30 minutes twice daily for 4 weeks.

Again, functional activities were assessed after 4 weeks in each patient. Patients were discharged with instructions and to continue the exercises at home along with medication. Patients were further evaluated at 1 month, 3 months and 6 months.

Intervention

PNF exercises were implemented in cephalo-caudal direction. Initially the exercises were given for neck and trunk followed by scapula, pelvis and then upper and lower extremity.

PNF for neck: Flexion with rotation to the left and extension with rotation to the right and vice-versa.

PNF for trunk: Rhythmic stabilization and alternating isometrics.

PNF for scapula and pelvis: Anterior elevation and posterior depression; posterior elevation and anterior depression by rhythmic initiation and repeated contraction.

For upper and lower extremity: D1 and D2 flexion and extension patterns.²⁻³

RESULTS

We applied independent t-test to compare the means of Barthel's-Index scores and Stroke specific quality of life scores in Urban and Rural groups. In our study 49 patients were from rural and 41 were from urban area. 26 were females and 64 were males. 33 were right hemiplegic and 57 were left hemiplegic. Patients in both groups were having almost same demographic features (Table 1).

Independent t-test was applied to assess the efficacy results in between group (Table 2). There was significant improvement in Barthel's-Index scores at 4 weeks (0.037) and 6 months (0.005) (Figure 1). Fugl-Meyer scores also showed significant difference at 6 months (0.001) but at 4 weeks no significant difference was found (0.161) (Figure 2). Quality of life was more improved in urban group at 4 weeks, 3 months and 6 months (<0.05) (Figure 3). We analyzed differences of means within group.

There was significant improvement in activities of daily living, sensory motor recovery and quality of life at 6 months in each group. We also analyzed the Barthel's-Index and SSQOL scores in different cohorts such as ischemic hemorrhagic, male- Female and Left- right side

stroke. We found no significant difference in the scores after the intervention (Table 3).

Table 1: Showing the baseline characteristics of the subjects enrolled in the study.

	Urban n= 41	Rural n=49	P- value
Sex female/ male	8/33	18/31	0.102 ^a
Side affected (right/left)	20/26	15/29	0.518 ^a
Type of stroke (ISCH/ HAEM.)	26/15	38/11	0.070 ^a
GCS	14.95±.281	14.95±0.285	0.884 ^b
NIHSS (0- 42)	6.6±3.49	6.5±3.79	0.605 ^b
MMSE	23.88±4.56	23.26±4.65	0.527 ^b
BI	26.95±17.31	33.97±24.53	0.127 ^b
FMA	157.80±45.45	161.98±44.35	0.661 ^b
SSQOL	134.22±39.88	153.4±48.60	0.501 ^b
Days of stroke	3.16±1.04	14.53±4.09	0.000 ^b

GCS: Glasgow Coma Scale, NIHSS: National Institute of health Stroke Scale, MRS: Modified Rankin Scale, MMSE: Mini Mental State Exam, BI: Barthel's- Index, FMA: Fugl- Meyer Assessment, SSQOL: Stroke Specific Quality of Life, a: Chi- Square Test, b: Independent t- test

Table 2: Showing the difference in means of Barthel- index, Fugl-Meyer assessment and stroke specific quality of life scores in between and within group.

	Urban (mean± SD)	Rural (mean± SD)	P-value in between gp. (95% ci)	P-value within gp.
Barthel- index				
Admission	33.97± 24.53	26.95± 17.31	0.127 (-2.03- 16.03)	<0.05
4 weeks	51.22±24.01	41.09± 18.35	0.037 (0.615- 19.05)	<0.05
6month	90.20±15.30	81.09±19.26	0.005 (2.87- 15.33)	<0.05
Fugl- meyer assessment				
Admission	161.98±44.98	157.80±45.45	0.661 (-14.69- 23.04)	<0.05
4 weeks	184.86±38.89	174.44±30.84	0.161 (-4.49- 23.04)	<0.05
6 months	211.00±22.84	184.07±25.25	0.001 (16.84- 37.08)	<0.05
Stroke specific quality of life				
1 month	153.0±48.60	134.22±39.88	0.051 (-0.04- 37.68)	<0.05
3 months	185.57±48.96	162.71±37.07	0.016 (4.37- 41.37)	<0.05
6months	199.57±48.01	181.32±35.09	0.046 (0.32- 36.18)	<0.05

In between group (Independent t- test), Within group (paired t- test)

Table 3: Showing the difference of scores from discharge to 6 months and level of significance in different cohorts.

Parameters	N	Difference in SSQOL scores from 4weeks-6months	Difference in BI scores from 4weeks-6months
Type of stroke			
Ischemic	55	32	52
Hemorrhagic	35	29	56
P-value (within gp.)		0.001	0.001
P- value in between gp.)		0.284	0.210
Sex			
Male	26	31	55
Female	64	31	53
P-value (within gp.)		0.001	0.001
P- value in between gp.)		0.762	0.872
Side affected			
Right	35	31	60
Left	55	31	48
P-value (within gp.)		0.001	0.001
P- value in between gp.)		0.973	0.124

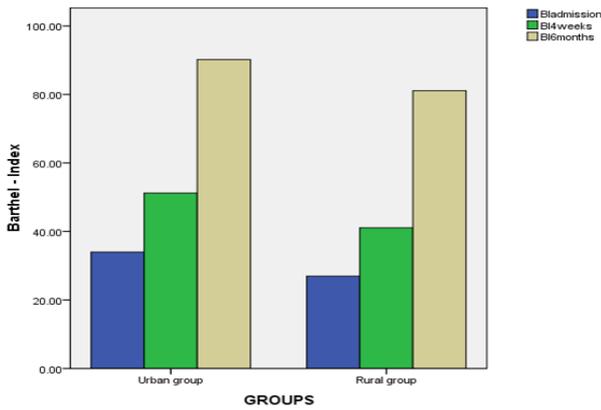


Figure 1: Showing more improvement in functional activities in early rehabilitation (urban) group.

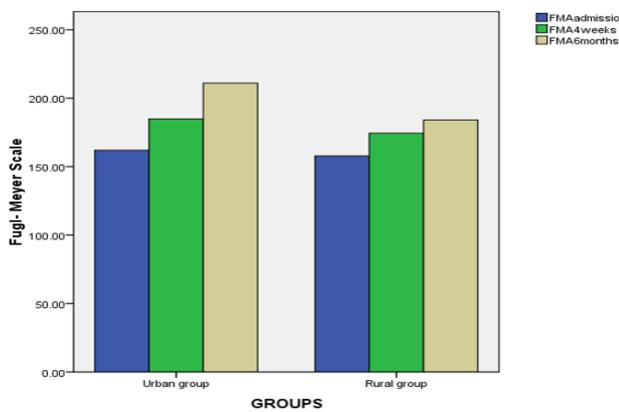


Figure 2: Showing more improvement in Fugl- Meyer scores in early rehabilitation (urban) group.

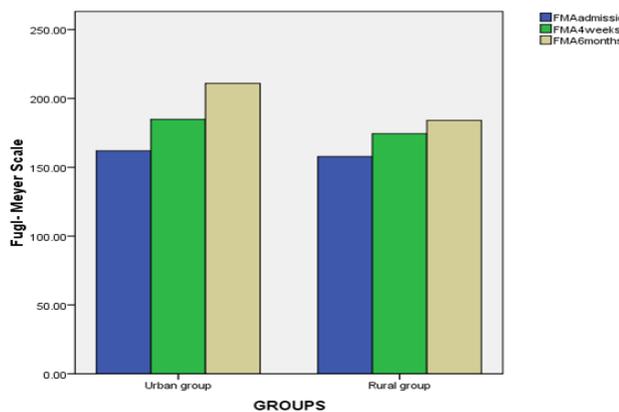


Figure 3: Showing more improvement in quality of life scores in early rehabilitation (urban) group.

DISCUSSION

The main objective to carry out this study was to evaluate the responses of early vs. late PNF exercises in acute stroke. In our study patients from rural areas came to our hospital after 2-3 weeks of stroke. It is well known that lack of exercises to the paretic limb may result in

deformity and hence disability. In our study we found that there was significant difference in the Barthel's-Index score and Stroke Specific Quality of Life score at 4 weeks and 6 months patients. We find in our results that stroke outcome is affected by the interval between stroke occurrence and rehabilitation and other medical managements. O' Neill et al who has reported no differences in recovery pattern among two populations.¹⁰

In our study we found the result that patients with Barthel's-Index >85 and SSQOL scale > 200 at 6 months and were independent in their all activities of daily living and were leading better life. There are a large number of individuals living in population centers with fewer health care supports and services than is typically found in large urban areas.⁸ The heavier burden of stroke shifted from urban to rural areas where a larger population resides, and healthcare services are less developed than in urban areas in India. The increasing trend in the younger population will impose a greater burden in the near future. Healthcare policymakers need to focus their attention on this situation and take suitable measures to cope with the challenges it poses.

Despite of effects of PNF exercises on functional outcome and quality life in rural and urban population, we also tried to find the efficacy of PNF exercises in other cohorts such as ischemic vs. hemorrhagic stroke, male vs. female and left vs. right hemispheric stroke. On analysis we found there was equal improvement in both ischemic and hemorrhagic stroke group. Studies reported earlier state that hemorrhagic stroke have higher mortality risk than ischemic strokes but stroke outcome after PNF application in acute stroke has never been tried.¹¹⁻²⁰ Paolucci et al has stated that the patients with hemorrhagic stroke have better functional prognosis but the other prognostic factors such as stroke origin, stroke severity, age and onset to origin interval strongly affect the functional outcome.²⁸ Haacke et al considered Barthel's-Index as an important predictor of quality of life. They classified the scores as <30=Needs Institutional care, 30-70= Needs some help and >70 Functionally independent.²¹

We also compared the functional outcome and quality of life in male and female group of life stroke patients. Both groups improved equally and significantly at 6 months. However, quality of life is not only affected by involvement of the upper and lower extremity, but social and family support has a very important role in deciding quality of life of a stroke survivor. In urban areas most of the families are single and in rural areas still the trend of joint families is there. So, the care taking is more in urban areas and hence more psychological support and less depression.

We also compared the effects of PNF exercises in left and right hemispheric stroke. Again, we found that PNF improved the functional outcome and quality of life irrespective of hemisphere involvement. Our study is

supported by the results of study carried out by Nam et al he had concluded that the effect of paralysis on dominant hand and quality of life in patients with subacute stroke is not significantly different from the effect of paralysis on non-dominant hand.²⁰ Paralysis of dominant hand had no added effect on Quality of life beyond the effect of stroke itself. Pyun et al found that ADL and depression were the two major factors affecting QOL after a stroke.²⁹ He used Quality of Life Index to measure quality of life in chronic stroke patients and found no statistical difference in QOL in right and left hemiparesis. We also found no statistically significant differences between the groups in ADL using the BI and SSQOL scores. Our results are consistent with the previous studies.²²⁻²⁴ The individuals who participated in rehabilitation program showed significant improvement in physical and functional performance as stated by earlier studies.²⁵⁻²⁷

In our study all the patients received equal session of exercises and from the first day of the admission to the hospital. In addition to this the patients received session of speech therapy where required and other medical management available at our institution. Patients were called upon in Outpatient department at equal intervals. However, some patients residing in the rural areas were difficult to follow up. In that case data was taken telephonically. This is the limitation of our study and this may be the reason for slightly better score in urban population, but the difference was not significant.

CONCLUSION

Early rehabilitation results in shorter hospital stay, better improvement and less disability. We can say PNF exercises improve the functional outcome and hence quality of life irrespective of side of stroke, type of stroke and gender.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Manimmanakorn N, Vichiansiri R, Nuntharuksa C, Permsirivanich W, Kuptniratsaikul V. Quality of life after stroke rehabilitation among urban vs. rural patients in Thailand. *J Med Assoc Thai Chotmaihet Thangphaet.* 2008;91:394-9.
2. Allen L, McIntyre A, Janzen S, Richardson M, Meyer M, Ure D, et al. Community stroke rehabilitation: how do rural residents fare compared with their urban counterparts? *Canadian J Neurol Sci Le J Canadien Des Sci Neurol.* 2016;43:98-104.
3. Kabat H. Studies on neuromuscular dysfunction: The role of central facilitation techniques for treatment of paralysis. *Arch Phys Med.* 1952;33:521-33.
4. Kabat H. Central facilitation: The basis of treatment for paralysis. *Permanente Foundation Medical Bulletin.* 1952;10:190-204.
5. Sherrington CS. *The Integrative Action of the Nervous System*, ed 2, New Haven, CT, Yale University Press:1947:36-115.
6. Irwin OC. Proximodistal differentiation of limbs in young organisms. *Psychol Rev.* 1993;40:467-77.
7. McGraw M. Grasping in infants and the proximodistal course of growth. *Psychol Rev.* 1993;40:301-2.
8. Voss DE. Proprioceptive neuromuscular facilitation. *Am J Phys Med.* 1967;46:838-98.
9. Census of India 2011. Provisional population totals. Some concepts and definitions. *Census of India.* 2011:1.
10. O'Neill NP, Godden DJ. Stroke outcomes in Northern Scotland: does rurality really matter? *Rural and remote health.* 2003;3:243.
11. Sacco RL, Wolf PA, Kannel WB, McNamara PM. Survival and recurrence following stroke. The Framingham study. *Stroke.* 1982;13:290-5.
12. Bamford J, Dennis M, Sandercock P, Burn J, Warlow C. The frequency, causes and timing of death within 30 days of a first stroke: the Oxfordshire Community Stroke Project. *J Neurol Neurosurg Psychiatry.* 1990;53:824-9.
13. Lauria G, Gentile M, Fassetta G, Casetta I, Agnoli F, Andreotta G, et al. Incidence and prognosis of stroke in the Belluno province, Italy. First-year results of a community-based study. *Stroke.* 1995;26:1787-93.
14. Anderson CS, Jamrozik KD, Broadhurst RJ, Stewart-Wynne EG. Predicting survival for 1 year among different subtypes of stroke. Results from the Perth Community Stroke Study. *Stroke.* 1994;25:1935-44.
15. Ellekjaer H, Holmen J, Indredavik B, Terent A. Epidemiology of stroke in Innherred, Norway, 1994 to 1996. Incidence and 30-day case-fatality rate. *Stroke.* 1997;28:2180-4.
16. Di Carlo A, Inzitari D, Galati F, Baldereschi M, Giunta V, Grillo G, et al. A prospective community-based study of stroke in Southern Italy: the Vibo Valentia incidence of stroke study (VISS). Methodology, incidence and case fatality at 28 days, 3 and 12 months. *Cerebrovascular diseases (Basel, Switzerland).* 2003;16:410-7.
17. Tsiskaridze A, Djibuti M, van Melle G, Lomidze G, Apridonidze S, Gaurashvili I, et al. Stroke incidence and 30-day case-fatality in a suburb of Tbilisi: results of the first prospective population-based study in Georgia. *Stroke.* 2004;35:2523-8.
18. Lavados PM, Sacks C, Prina L, Escobar A, Tossi C, Araya F, et al. Incidence, 30-day case-fatality rate, and prognosis of stroke in Iquique, Chile: a 2-year community-based prospective study (PISCIS project). *Lancet (London, England).* 2005;365:2206-15.

19. Corbin DO, Poddar V, Hennis A, Gaskin A, Rambarat C, Wilks R, et al. Incidence and case fatality rates of first-ever stroke in a black Caribbean population: the Barbados Register of Strokes. *Stroke.* 2004;35:1254-8.
20. Nam HU, Huh JS, Yoo JN, Hwang JM, Lee BJ, Min YS, et al. Effect of dominant hand paralysis on quality of life in patients with subacute stroke. *Annals of rehabilitation medicine.* 2014;38:450-7.
21. Haacke C, Althaus A, Spottke A, Siebert U, Back T, Dodel R. Long-Term Outcome After Stroke:Evaluating Health-Related Quality of Life Using Utility Measurements. *Stroke.* 2006;37:6.
22. King RB. Quality of life after stroke. *Stroke.* 1996;27:1467-72.
23. Harris JE, Eng JJ. Individuals with the dominant hand affected following stroke demonstrate less impairment than those with the nondominant hand affected. *Neurorehabilitation and neural repair* 2006;20:380-9.
24. Spaulding SJ, McPherson JJ, Strachota E, Kuphal M, Ramponi M. Jebsen hand function test: performance of the uninvolved hand in hemiplegia and of right-handed, right and left hemiplegic persons. *Archives of physical medicine and rehabilitation.* 1988;69:419-22.
25. Hopman WM, Verner J. Quality of life during and after inpatient stroke rehabilitation. *Stroke.* 2003;34:801-5.
26. Kelley RE, Borazanci AP. Stroke rehabilitation. *Neurological research.* 2009;31:832-40.
27. Kwok T, Lo RS, Wong E, Wai-Kwong T, Mok V, Kai-Sing W. Quality of life of stroke survivors: a 1-year follow-up study. *Archives of physical medicine and rehabilitation.* 2006;87:1177-82.
28. Paolucci S, Antonucci G, Grasso MG, Bragoni M, Coiro P, De Angelis D, et al. Functional outcome of ischemic and hemorrhagic stroke patients after inpatient rehabilitation. *Stroke.* 2003;34(12):2861-5.
29. Pyun SB, Kim SH, Hahn MS, Kwon HK, Lee HJ. Quality of life after stroke. *J Korean Academy Rehabilitation Medicine.* 1999;23(2):233-9.

Cite this article as: Singh AK, Chaturvedi P, Maurya PK, Kulshreshtha D, Qavi A, Thacker A. Early PNF exercises functional outcome and quality in patients with stroke of urban and rural area in Uttar Pradesh: a prospective community based study. *Int J Res Med Sci* 2018;6:639-44.