Original Article

Prevalence of Hemiplegic Shoulder Pain in Post-stroke Patients – A Hospital Based Study

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Abstract

Objectives: To study the prevalence of hemiplegic shoulder pain (HSP) and its association with other factors like age, sex, side of paralysis, type of brain lesion, muscle tone, degree of functional recovery in upper limb and glenohumeral subluxation (GHS).

Methodology: Prospective study based on all the hemiplegic 140 patients admitted in the physical medicine and rehabilitation ward in two consecutive years.

Tools: Assessment of HSP was done by using a structured questionnaire known as "Shoulder Q". Modified Ashworth scale (MAS) was used for spasticity assessment and functional independence measure (FIM) to document the severity of disability.

Follow-up at intervals of 1, 3 and 6 months from the date of discharge for all cases were attempted and even cases with at least one follow-up around 3 months were also included in the study. Analysis was done on 109 patients as 31 patients lost to follow-up.

Results: Out of the 109 patients, 61.5% were males with a mean age of 58.9 ± 10.9 years. Cerebral infarct represents 53.2% of patients. HSP was present in 47.7% (n= 52) of patients. The prevalence of HSP on left and right sides was comparable though involvement was more on the left side (58.8%). Glenohumeral subluxation was present in 32.7% (n=17) of 52 cases with HSP and 33.3% (n=19) of 57 cases without HSP. Mean FIM score at admission for patients with HSP was 54.5 ± 17.6 and 56.6 ± 19.5 among cases without HSP. Again, mean FIM scores at last follow-up were 80.0 ± 16.4 and 79.9 ± 18.9 respectively for both cases with HSP and without it. Among the compliers, patients with tone more than MAS=1 were more likely to develop HSP.

Conclusion: Prevalence rate of HSP among post-stroke hemiplegic patients admitted during two years was 47.7%. There was no association of HSP with factors like age, sex, side of paralysis, type of lesion and GHS. Correlation between HSP and muscle tone or degree of functional recovery was significant.

Key words : **Post-stroke hemiplegia, hemiplegic shoulder pain, glenohumeral subluxation, functional independence measure.**

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Introduction:

Stroke[1] is a world-wide health problem; with incidence ranging from 0.2 to 2.5 per thousand per year according to WHO Collaborative Study in 12 countries. It accounts for 20% of neurological admissions. Till date, in India there have been only a few community based studies for either prevalence or incidence of stroke; with one reporting a prevalence rate of 334/100,000 and an incidence of 73/100,000 in 1990[2]. Post-stroke hemiplegia is one of the most common causes of disability in adults. Prevalence of hemiplegia in South India is 56.9 per 100,000; as compared to 150 to 186 per 100,000 in the USA and Europe. Hemiplegic shoulder pain (HSP) is one of the commonest complications, occurring in about 20-72% of such patients with average figures ranges from 43 to 64%[3-10]. Kalichman and Ratmansky[11] reported

prevalence of HSP is approximately 22%-23% in the general population of stroke survivors and approximately 54%-55% among stroke patients in rehabilitation settings. It interferes with effective rehabilitation programme of upper limb in hemiplegia, thereby, compromising functional recovery and prolonging hospital stay. Good management of patients can reduce both the frequency and intensity of shoulder pain, improving functional outcome. There are not enough studies done to establish incidence of HSP with various risk factors[12].

The primary cause of HSP is not fully understood. According to involvement of anatomical structures, the causes of HSP may be due to; (i) rotator cuff tear, (ii) over-stretching of ligaments and muscles, like supraspinatus and deltoid, (iii) spasticity, (iv) muscle trigger points, (v) subacromial bursitis, (vi) tendinitis of long head of biceps tendon, (vii) adhesive capsulitis, (viii)impingement syndromes, (ix) reflex sympathetic dystrophy, (x) brachial plexopathy and (xi) central pain syndromes[13]. Shoulder subluxation, occurs at an early stage after stroke and is associated with subluxation of the shoulder joint and spasticity (mainly subscapularis and pectoralis). Dromerick *et al*[14] also implicate 2 vertical stabilisers of the humerus namely the long head of the biceps and the supraspinatus in early onset hemiplegic shoulder pain. Further, Huang *et al*[15] reported that the frequency of shoulder soft tissue injuries (85%) and HSP (67%) was higher in patients with hemiplegic shoulder with impaired sensation, spasticity, subluxation, and restricted rotation. Frequency of abnormal sonographic findings and shoulder pain and visual analogue scale score of HSP before discharge were significantly higher in the poor motor function group than in the good motor function group.

This study was aimed to find out the prevalence of HSP, degree of association between HSP and other factors like age, sex, side of paralysis, type of brain lesion, muscle tone, degree of functional recovery in upper limb and glenohumeral subluxation (GHS).

Materials and Methods:

A prospective study which included all the new hemiplegia patients in the age group of 40-80 years admitted in two years was conducted in the department of physical medicine & rehabilitation, Regional Institute of Medical Sciences, Imphal. Out of the total 140, analysis was done on 109 patients as twenty-seven were lost to follow-up and another four expired during the study period. Informed consent was taken before inclusion in the study.

Comatose patients, recurrent stroke, thalamic pain syndrome, comorbid conditions like diabetes, chronic obstructive lung disease, coronary artery disease, malignancy, severe arthritis of shoulder and recent fracture of humerus, clavicle etc, were excluded from the study.

Clinical diagnosis of stroke was confirmed by CT scan of brain in all the cases. Range of motion of the affected shoulder joint was measured by using a goniometer. Other important clinical tests for impingement, laxity of joint, tendinitis and rotator cuff lesions were also performed in appropriate cases. Modified Ashworth scale (MAS) was used for spasticity assessment and functional independence measure (FIM) to document the severity of disability as well as the outcomes of the rehabilitation treatment.

Assessment of severity of HSP was done by using a structured questionnaire developed by Turner-Stokes and Jackson[16] called the “Shoulder Q” which consists of verbal rating scale and visual graphic rating scale designed to assess even in those subjects with language and visuospatial deficits. Shoulder Q[16] is a simple and practical tool for evaluation of shoulder pain. Changes on visual graphic rating scale (VGRS) were associated with verbal reports of improvement ($p < 0.001$). Summed VGRS score of 3 showed 77% sensitivity and 91.3% specificity for identifying the responders to the treatment, with a positive predictive value of 93.3%. Summed VGRS scores of =2 had a negative predictive value of 73.3%.

Follow-up at intervals of 1, 3 and 6 months from the date of discharge for all cases were attempted and even cases with at least one follow-up around 3 months were also included in the study.

Those patients who attended the department within a period of 12 weeks after stroke were defined as “early cases” and after that they were labelled as “late cases”. Again, for the convenience of assessing effectiveness of rehabilitation intervention of HSP, patients were grouped into “complier” if they attended at least one follow-up within 12 weeks after admission and another within 6 months of the first follow-up. Whereas, “non-complier” was labelled to those patients who had irregular follow-up and was also assumed to have received inadequate rehabilitation intervention.

The data was processed by using SPSS (Version 12). Chi-square test and logistic regression analysis were used.

The study was undertaken after getting ethics approval from the Institutional Ethics Committee.

Results:

Out of the 109 patients, 61.5% (n=67) were males while 38.5% (n=42) were females. Mean age group was 58.9 ± 10.9 (range 41-80 years). Maximum number of patients belonged to the age group 51-60 years (n=42), while minimum was in the age group 71-80 years (n=18).

Cerebral infarct was more common than haemorrhage (53.2% vs 46.8%). HSP was present in 47.7% (n= 52) of patients of the 109 patients evaluated. It was more prevalent among cerebral infarct patients (n= 30 of 58 patients, 51.7%) than those with haemorrhage (n=22 of 51 patients, 43.2%).

Left sided hemiplegia was seen more than the right (58.8% vs 42.2%). However, the prevalence of HSP on left and right sides were comparable (47.8% vs 47.6%).

Mean post-stroke duration at admission was 15.03 ± 32.39 weeks (range between 2 days to 154 weeks). Out of the 84 early patients, 41.7% (n=35) developed HSP and 68% (n=17) developed HSP out of the 25 late cases. Prevalence between late and early cases were statistically significant (p=0.021). Again, *the prevalence of HSP among compliers was 11.1%, while that of the non-compliers was 35.7% at the end of the follow-up. The difference was found to be statistically significant.*

Glenohumeral subluxation was present in 32.7% (n=17) of 52 cases with HSP and 33.3% (n=19) of 57 cases without HSP. Their association was not statistically significant.

Reflex sympathetic dystrophy was found in 15.6% (n=17) of the total cases and in 32.7% of HSP cases.

Mean FIM score at admission for patients with HSP was 54.5 ± 17.6 and 56.6 ± 19.5 among cases without HSP. Again, mean FIM scores at last follow-up were 80.0 ± 16.4 and 79.9 ± 18.9 respectively for both cases with HSP and without it.

Association of HSP with tone of upper extremity according to MAS, side of paralysis and recovery measured by FIM etc, were tested by logistic regression analysis. Subjects were categorised into complier who is regular in follow-ups (n=36) and non-complier who is not regular in follow-ups (n=73) to remove the effect of confounding factors of compliance to treatment.

Logistic regression analysis was done to find out relation of HSP with tone, side and recovery among compliers and non-compliers (Tables 1 and 2).

Odd's ratio was calculated from values among the compliers and patients with tone more than MAS=1 were more likely to develop HSP. Similarly, patients having good recovery as assessed by FIM (score of >72) had 52% less chance of developing HSP. The degree of association between HSP and side of paralysis was weak.

Table I: ***Logistic Regression Analysis of HSP with Tone, Recovery, GHS and Side of Paralysis in Compliers***

	B	S.E	Sig	Exp(B)	95% C.I. for Exp (B)(Lower)	95% C.I. for Exp (B)(Upper)
FIM2 CAT (1)	-0.680	1.246	0.586	0.507	0.044	5.830
Tone CAT (1)	0.548	1.251	0.661	1.730	0.149	20.094
GHS II (1)	7.145	43.732	0.870	1267.231	0.000	2.126455036399467 E+40
Side	-0.084	0.409	0.838	0.920	0.412	2.052

FIM 2 CAT(1) represents FIM assessments at second follow-up where 0 = persons having FIM score ≤ 72 and "1" = those with FIM score > 72.

Tone CAT(1) represents tone of the patients at second follow-up where '0'= FIM persons having MAS score ≤ 1 and "1" = those with tone MAS score > 1.

GHS II represents persons with GHS at the second follow-up where '0' = absent GHS and '1'= present GHS.

Side represents the side of paralysis where '1'= right and '2'= left.

Table 2: ***Logistic Regression Analysis of HSP with Tone, Recovery, GHS and Side of Paralysis in Non-compliers***

	B	S.E	Sig	Exp(B)	95% C.I. for Exp (B)(Lower)	95% C.I. for Exp (B)(Upper)
FIM2 CAT(1)	-0.444	0.559	0.428	0.642	0.214	1.920
Tone CAT (1)	0.119	0.514	0.817	1.126	0.412	3.083
GHS II (1)	-0.339	0.589	0.565	0.713	0.225	2.259
Side	0.229	0.495	0.643	1.258	0.476	3.322

Again among the non-compliers, odd's ratio value for those with more spasticity and better motor recovery were just the reverse of that of compliers. It explains that rehabilitation intervention had an overriding influence over the occurrence of HSP in relation to variables like tone and degree of motor recovery.

Discussion:

The prevalence rate of HSP among post-stroke hemiplegia patients in the present study is similar with the finding of Poulin de-Courval *et al*[6] (47.9%). No relation between age groups and HSP was also reported by Griffin[17] and Cheng *et al*[10].

A study by Davis *et al*[18] had found predilection of HSP among right sided hemiplegia, while HSP was more prevalent among left sided hemiplegia as reported by Pauline de Courval *et al*[6]. Present study showed more cases of left sided hemiplegia (57.8%) and a similar prevalence of HSP on both sides. Cheng *et al*[10] also did not find any relationship between HSP and side of paralysis.

There were two common factors associated with patients with HSP; loss of range of motion of shoulder, especially external rotation, and subluxation of glenohumeral joint.

Present study showed a positive correlation between HSP and increased tone which is similar to reports of studies by Van Ouwenaller *et al*[7] and Poulin de Courval *et al*[6]. However, studies done by Bohannon and Andrew[5] and Joynt[19] have not found relationship between spasticity and HSP.

No association was found in the study between HSP and GHS, which was similar to studies done by Bohannon and Andrews[5], Wanklyn *et al*[8] and Zorowitz *et al*[9]. However, a positive correlation was also reported by Van Ouwenaller *et al*[7] and Najenson *et al*[20].

There was a window of opportunity to observe two types of post-stroke hemiplegic patients which was categorised into early and late cases. The median time for development of HSP was within the first 12 weeks of post-stroke. Hence, twelve weeks was taken as the limit to differentiate between early case who sought rehabilitation within 12 weeks and late case who reported after 12 weeks. Early cases were assumed to have learned and received the rehabilitation early.

It was found that HSP was more prevalent and persisted among the late cases at follow up which was found statistically significant (p=0.021). This showed that institution of early rehabilitation was effective in prevention and improvement of HSP.

Another method of assessing the effectiveness of the rehabilitation intervention was by comparing its prevalence in compliers and non-compliers which was found significant (p=0.042). It may also be presumed that the rehabilitation intervention practiced in RIMS was effective in the prevention and management of HSP syndrome.

A similar study was done by Wanklyn *et al*[8] where the followed-up 108 patients over a period of 6 months for prevalence of HSP and correlation with other factors. It was reported that HSP developed in 63.8% patients and its prevalence increased in the first few weeks post discharge. They also found a strong association between HSP and poor motor recovery.

Conclusion:

Prevalence rate of HSP among post-stroke hemiplegia patients admitted during two years was 47.7%. There was no association of HSP with factors like age, sex, side of paralysis, type of lesion and GHS. Correlation between HSP and tone or degree of functional recovery was significant.

It was also found that the rehabilitation intervention practiced in the management of HSP was effective as was evident from the prevalence of HSP among early and late cases and compliers and non-compliers.

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