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Original research article

An Analytical Cross-sectional Study to Evaluate Shoulder Pain, Depression and Sleep Quality in Hemiplegic Patients

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Abstract

Aim: Evaluate of Shoulder Pain, Depression and Sleep Quality in Hemiplegic Patients

Methods: The cross-sectional study which was carried in the Department of Physical Medicine and Rehabilitation, PMCH Patna, Bihar, India, for 1 year. In the scope of the study, patients with hemiplegia who applied to physical therapy and rehabilitation clinic between 2019-2020 evaluated. Patients 18 years of age or older, having a diagnosis of hemiplegia, and agreeing to participate in the study. Patients who did not agree to participate in the study were not included in the study group. The sleep quality of the patients was evaluated with the Pittsburgh Sleep Quality Index (PSQI).

Results: The study group consisted of 50 patients, 30 men and 20 women, and the average age of the patients was 69.88 ± 10.84 (20–84) years. The frequency of hemiplegic shoulder pain in the study group was found to be 20% (n=10). The median age of patients with HSP (71.5[55.0-85.0] years) and patients without HSP (71.0 [20.0-86.0]) were found to be similar (p=0.37). No significant difference was found between hemiplegia duration in patients with and without HSP (3.1[1.0-29.0] weeks *vs.* (4.6 [1.0-25.0]) (p=0.82). No relationship was found between having shoulder pain in patients with hemiplegia and gender, education level, family support, CT result, antidepressant use, anxiolytic use and antipsychotic use. It was found that the frequency of shoulder pain among patients with hemiplegia did not change according to ambulation status(p=0.088). The median scores of patients with and without shoulder pain on the PSQI (p=0.44) and BDI (p=0.34) scales were found to be similar.

Conclusion: No relationship was found between having shoulder pain and age, gender, family support, ambulation status, depression, and sleep quality. It was found that patients with shoulder pain had significantly worse motor functions in patients diagnosed with hemiplegia.

Keywords: Hemiplegia, shoulder pain, depression

Introduction

Sleeping is a mechanism to recover the physical functions, maintain strength and recharge human physical and emotional energies, as the most important resting method in an unconscious state from which one can be awoken by an adequate sensory stimulus.[1]In other words, sleeping is essential for well-being, daily activities and maintenance of homeostasis.[2] On the other hand, sleep quality deteriorates in most patients after the onset of stroke, ultimately manifesting in a number of sleeping problems, including more frequent drowsiness during the

day and a general fatigue that affects their participation in rehabilitation programs and the performance of daily activities.[3-5] In addition, it has been reported that about 30–50% of stroke patients complain of a number of pains such as shoulder pain, headache, topic pain, or central pain after the onset.[6,7] If these pains are prolonged, other pain-related symptoms such as sleeping disorder, insecurity, depression, or fear may be accompanied. Furthermore, these could cause disabilities in daily activities, decline in social activities, etc.[8,9] Generally, previous studies have mentioned a number of factors that affect daily activities of stroke patients such as the degree of brain damage, motor skill damage, time for rehabilitative therapy, level of cognitive and sensory disabilities, and depression levels, etc.[10,11] but only a few studies focus on the sleep quality, pain, and basic activities of daily living (BADL). Significantly, few studies have reported correlations among the capacities of instrumental activity of daily living (IADL), pain and sleep quality, the importance of which will relatively increase due to the characteristics of patients with chronic stroke, who spend most of their time in their local communities, including their household in the chronic phase of their disease after the initial hospitalization phase.

Hemiplegic shoulder pain (HSP) is defined as musculoskeletal pain in the weakened shoulder of individuals with hemiplegia due to stroke . The clinical features of HSP range from mild discomfort to debilitating pain that lead to gradual deterioration in functions due to decreased range of motion, ultimately resulting in increased disability. Although pain in the human body is undoubtedly associated with physical conditions, it is also a physical and psychological stress or that can affect a person's temperament and mood, which may explain its relationship with psychiatric characteristics.[12] It has been reported that HSP is an additional risk factor for the onset of depressive disorders and interferes with the functioning of the individual.[13] [In addition, many patients with HSP suffer from moderate/severe pain that intensifies at night and causes adverse effects on sleep. Taken together, it is evident that, in addition to being a physical problem, HSP causes various types of problems, including increased hospitalization, impaired functionality, depression, sleep disturbance and other adverse effects on quality of life.

Material and methods

The cross-sectional study which was carried in the Department of Physical Medicine and Rehabilitation,PMCH Patna, Bihar, India, for 1 year, after taking the approval of the protocol review committee and institutional ethics committee.

In the scope of the study, patients with hemiplegia who applied to physical therapy and rehabilitation clinic between 2019-2020 evaluated. Inclusion criteria were accepted as being 18 years of age or older, having a diagnosis of hemiplegia, and agreeing to participate in the study. Patients who did not agree to participate in the study were not included in the study group.

Patients' age, gender, hemiplegia diagnosis time (weeks), education level, clinical evaluation results, presence of shoulder pain, Computerized Tomography (CT) results, family support status, antidepressant drug use, anxiolytic drug use, antipsychotic drug use, functional evaluations, ambulation status, depression and sleep quality scales were evaluated and recorded. The presence of shoulder pain was evaluated as present/absent.

After informing patients of the scope and purpose of the study in a detailed manner before the study, verbal consent was obtained from those who agreed to participate in the study. The clinical evaluation of each patient was performed and questionnaire forms were filled out. This process took about 30 minutes.

The sleep quality of the patients was evaluated with the Pittsburgh Sleep Quality Index (PSQI).[14] The PSQI evaluates the last 30 days of sleep with a 24- item self-report scale. Among the items in the scale, 19 items are directly self-reported, while the remaining 5 items are to be answered by the individual's spouse or roommate. The scale has 7 sub-dimensions: Subjective Sleep Quality, Sleep Latency, Sleep Duration, Habitual Sleep Efficiency, Sleep Disorder, Use of Sleeping Drugs, and Daytime Dysfunction. Each component is evaluated on a scale of 0–3 points and the sum of the scores from these 7 sub-dimensions constitutes the total score which varies between 0–21 points, and a total score greater than 5 means that sleep quality is poor.[14,15] Brainstorm motor staging was used to evaluate the motor functions of the patients. In this staging, the upper extremity, lower extremity and hand are evaluated separately. Motor functions of hemiplegic patients are evaluated in 6 stages: Stage I flask is the stage where there is no voluntary movement and Stage VI defines isolated joint motion. Higher stage indicates better motor function.[16]

The ambulation status of the study group was evaluated using the Functional Ambulation Categories (FAC). It is divided into six categories according to ambulatory status. FAC 0: no ambulation no voluntary movements, FAC 1: requires continuous physical contact to support body weight, FAC 2: can support body weight but requires continuous physical assistance for balance, FAC 3: can walk on a level surface but requires cautious supervision, FAC 4:can walk independently on a level surface but needs assistance to traverse any non-level surface, FAC 5: independent ambulation.[17]

Symptoms associated with depression were evaluated using the Beck Depression Inventory (BDI). The BDI was developed by Beck et al. to measure emotional, cognitive, somatic and motivational components, and its validity and reliability study in the Turkish language was undertaken by Hisliand colleagues. Patients are asked to respond to the questions in the scale in the context of the last 7 days. The scale consists of 21 items: two for emotion, eleven for cognition, two for behavior, five for body perception, and one for interpersonal evaluation. The total score that can be obtained from the scale varies between 0–63 as each item is scored on a 0–3 point basis. Depression severity is evaluated as none/minimal depression (1-9), mild depression (10-16), moderate depression (17-29), severe depression (30-63).[18,19]

Statistical Analysis

The data obtained from the research were evaluated using the IBM SPSS (Version 21.0) statistics package program. For univariate logistic regression analysis performed to elucidate factors affecting sleep quality in hemiplegic patients, we defined sleep quality as a categorical variable according to PSQI scale scores. In the logistic regression analysis for depression, two groups were formed as (i) no depression or mild-minimal depression and (ii) moderate- severe depression. Statistical significance threshold was accepted as $p \leq 0.05$.

Results

The study group consisted of 50 patients, 30 men and 20 women, and the average age of the patients was 69.88 ± 10.84 (20–84) years. The frequency of hemiplegic shoulder pain in the study group was found to be 20% (n=10). The median age of patients with HSP (71.5[55.0-85.0] years) and patients without HSP (71.0 [20.0-86.0]) were found to be similar (p=0.37). No significant difference was found between hemiplegia duration in patients with and without HSP (3.1[1.0-29.0] weeks *vs.* (4.6 [1.0-25.0]) (p=0.82). No relationship was found between having shoulder pain in patients with hemiplegia and gender, education level, family support, CT result, antidepressant use, anxiolytic use and antipsychotic use (Table 1).

Table 1: Characteristics of study group according to shoulder pain

Shoulder pain				
	Absent n(%)	**Present n(%)**	**Overall n (%)**	**p-value**
Gender				
Male	28(63.64)	6(60.0)	30(60.0)	0.64
Female	16(36.36)	4(40.0)	20(40.0)	
Education level				
Primary school and lower	31(77.5)	8(80.0)	39(78.0)	0.27
High school	3(7.5)	2(20.0)	5(10.0)	
University	6(15.0)	0(0.0)	6(12.0)	
Family support status				
Absent	9(22.5)	4(40.0)	13(26.0)	0.27
Present	31(77.5)	6(60.0)	37(74.0)	
Computerized Tomography results				
Bleeding	5(12.5)	2(20.0)	7(14.0)	0.56
Ischemia	35(87.5)	8(80.0)	43(86.0)	
Use of antidepressants				
Absent	15(37.5)	5(50.0)	20(40.0)	0.49
Present	25(62.5)	5(50.0)	30(60.0)	
Use of anxiolytics				
Absent	38(95.0)	8(80.0)	46(92.0)	0.13
Present	2(5.0)	2(20.0)	4(8.0)	
Use of antipsychotics				
Absent	34(85.0)	9(90.0)	43(86.0)	0.67
Present	6(15.0)	1(10.0)	7(14.0)	
Total	40(100.0)	10(100.0)	50(100.0)	

It was found that the frequency of shoulder pain among patients with hemiplegia did not change according to ambulation status (p=0.088). However, the motor functions of patients with shoulder pain were significantly worse than those without (Table 2).

Table 2: Distribution of ambulatory status and motor functions by shoulder pain in patients with hemiplegia

Shoulder pain			**Overall n (%)**	**p-value**
	Absent n (%)	**Present n (%)**		
FAC				
FAC 0-2	16(40.0)	7(70.0)	23(46.0)	0.088
FAC 3-5	24(60.0)	3(30.0)	27(54.0)	
Brunnstrom-upper limb				
Stage 3 or lower	16(40.0)	8(80.0)	24(48.0)	0.025
Stage 4 or higher	24(60.0)	2(20.0)	26(52.0)	
Brunnstrom-lower limb				
Stage 3 or lower	14(35.0)	7(70.0)	21(42.0)	0.046
Stage 4 or higher	26(65.0)	3(30.0)	29(58.0)	
Brunnstrom-hand				
Stage 3 or lower	21(52.5)	9(90.0)	30(60.0)	0.04
Stage 4 or higher	19(47.5)	1(10.0)	20(40.0)	

FAC: Functional Ambulation Categories

The median scores of patients with and without shoulder pain on the PSQI (p=0.44) and BDI (p=0.34) scales were found to be similar (Table 3).

Table 3: Distribution of the scores obtained from the PSQI and BDI scales and depression levels according to shoulder pain in patients with hemiplegia.

Shoulder pain			**Total**	**p-value**
	Absent	**Present**		
PSQI				
PSQI score, median(min-max)	18.5(0.0-21.0)	20.0(1.0-21.0)	19.0(0.0-21.0)	0.44
BDI				
No depression / minimal depression, n(%)	9(22.5)	2(20.0)	11(22.0)	0.97
Mild depression, n(%)	15(37.5)	3(30.0)	18(36.0)	
Moderate depression, n(%)	13(32.5)	4(40.0)	17(34.0)	
Severe depression, n(%)	3(7.5)	1(10.0)	4(8.0)	
BDI score, median(min-max)	13.5(5.0-33.0)	18.0(6.0-32.0)	15.0(5.0-33.0)	0.34

Abbreviations: PSQI: Pittsburgh Sleep Quality Index; BDI: Beck Depression Inventory

In the univariate logistic regression analysis performed to elucidate the factors affecting sleep quality in hemiplegic patients, it was found that none of the factors examined had an effect on sleep quality.

In the univariate logistic regression analysis performed to elucidate factors affecting depression in hemiplegic patients, the following factors were found to be significant: increased age, female gender, absence of family support, worsening of Brunnstrom upper extremity, lower extremity and hand motor functions, and decreased ambulation level. In the multivariate logistic regression analysis performed with these factors, it was found that the absence of family support and increase score from the sleep quality scale were two factors affecting the increase in depression level (Table 4).

Table 4: The results of univariate and multivariate logistic regression analysis for factors affecting depression in hemiplegic patients

Univariate logistic regression analysis						Multivariate logistic regression analysis				
	B	SE	Wald	Exp B(95% CI)	p	B	SE	Wald	Exp B(95% CI)	p
Age	0.057	0.07	2.757	1.07 (0.99,1.13)	0.08	0.028	0.05	0.271	1.01(0.93,1.14)	0.61
Gender	1.659	0.63	7.108	5.26(1.55,17.77)	0.007	0.747	0.93	0.648	2.11(0.34,13.00)	0.43
0.684	-2.699	0.85	10.000	1.03(0.96, 1.11)	0.38					
0.684	-1.716	0.63	7.455	0.07(0.01,0.36)	0.003	-4.048	1.81	4.986	0.02(0.00-0.61)	0.027
0.684	-1.086	0.60	3.318	0.18(0.05,0.62)	0.007	-3.094	6.20	0.249	0.05(0.00-8506.89)	0.62
0.684	-1.232	0.63	3.790	0.34(0.11,1.09)	0.07	-3.318	2.61	1.460	23.39 (0.14-3890.23)	0.23

0.684	-2.308	0.67	10.819	0.29(0.08,1.01)	0.06	4.024	6.26	0.413	55.87(0.00-11813)	0.53
0.684	0.405	0.71	0.326	0.10(0.03,0.37)	0.001	-4.739	3.05	2.412	0.01(0.00,3.46)	0.13
0.684	0.185	0.08	5.788	1.50(0.37,6.03)	0.57					
0.684	0.684	0.684	0.684	1.20(1.03-1.40)	0.01	0.257	0.12	4.328	1.29(1.02,1.65)	0.04

CI: Confidence Interval; FAC: Functional Ambulation Categories; PSQI: Pittsburgh Sleep Quality Index

Discussion

Stroke is an important cause of mortality and long-term disability. It is reported that about half of the individuals who survive stroke will have hemiplegia and half of these patients will live with a dysfunctional arm.[20] In this study, firstly, the frequency and characteristics of HSP in hemiplegic patients were investigated, and secondly, the determinants of sleep quality and depression in hemiplegic patients were investigated Worldwide, HSP frequency after stroke was reported to be between 5%–84% in several studies. In Turkey, HSP frequency has been reported between 55%–63.5%.[21-23] We found that the prevalence of HSP is lower than the results previously reported for Turkey. This may be due to the differences in the groups studied, the study design (that included patients who applied themselves), and the assessment methods used for HSP diagnosis.

The relationship between age and HSP can be explained in various ways. First of all, the prevalence of shoulder pain is rather high in the elderly, independent of stroke. Second, the elderly generally have a lower functional level with a higher number of comorbidities compared to younger individuals. In the event of a possible stroke, the further limitations in ambulation may result in a higher risk for shoulder injury. Finally, it is also quite apparent that the higher risk of stroke among elderly patients will skew the data in the favor of higher HSP frequency in the elderly.[24] In some previous studies, it was reported that the age of patients diagnosed with HSP was significantly higher than those without HSP.[25] However, there are also studies reporting that there is no relationship between age and HSP.[26-29] , similar to our findings. Nevertheless, the fact that 86% of the patients in our study group were older than 60 years old may have affected our results. There was no significant relationship between HSP frequency and gender, consistent with the results found in the literature.[26-29]

In the study by Wanklyn et al., it was reported that 36.1% of the patients had HSP while discharged from the hospital, 54.6% had HSP in the eighth week, and 33.3% had HSP in the sixth month.[30] In a prospective study by Roy et al., it was reported that the time elapsed since stroke was significantly higher in patients diagnosed with HSP than in patients without HSP.[31] This relationship was also demonstrated in a Turkish-based investigation by Demirciand colleagues who reported that there was a positive correlation between the time elapsed after stroke and HSP.[22] In the present study, no relationship was found between the time elapsed after stroke and the frequency of HSP. Similarly, Aras et al. found no relationship between the times elapsed after stroke and the presence of HSP.[23] Interestingly, one study suggested that HSP development was more frequent in patients with shorter post-stroke duration.[27] However, drawing accurate conclusions in this regard is very difficult since patient characteristics, study designs and the design of the studies may lead to considerable differences in terms of time elapsed after stroke and its relationship with HSP.

Loss of motor function in stroke patients does not directly cause HSP, but severe motor impairment most likely causes a change in scapulohumeral rhythm or prolonged immobility in the shoulder and upper limb. Patients with severe motor impairment need more intensive and

long-term nursing care. All these factors predispose the shoulder structures to soft tissue damage and hence may lead to the emergence of HSP. According to the results of various previous studies, it has been reported that the frequency of motor function loss and functional dependence are higher among patients with HSP compared to those without.[32] With regard to functional characteristics, two studies using Brunnstrom staging have reported that motor function stage was significantly worse in patients with HSP.[23] Our finding is consistent with this information in the literature. However, it must be noted that studies reporting no significant difference between groups (with and without HSP) in terms of Brunnstrom stages also exist.[28] It has been reported that depression, which is a common complication after stroke, has negative effects on the functional recovery process–not only during hospitalization but also after discharge.[33] In previous studies, it was reported that the frequency of depression was higher in patients with stroke- related pain.[29,34] In addition, the quality of life of individuals experiencing post-stroke pain changes negatively in the presence of depression.[27] Therefore, the management of conditions related to depression in patients diagnosed with post-stroke hemiplegia appears to be important for stroke rehabilitation as a whole. In this study, no relationship was found between hemiplegic shoulder pain and depression. In the multivariate logistic regression analysis, we found that the presence of shoulder pain was not an effective factor to predict the level of depression. Our result is consistent with the results of the majority of previous research.[34,35] Depression is one of the four most common complications after stroke (depression [26%], shoulder pain [24%], falls [20%] and urinary tract infection [15%]).[36] It has been reported that depression presenting after a stroke can last for 1–3 years.[37] For this reason, it is possible that hemiplegic patients are likely to develop depression not only due to stroke, but also in relation with other adversities after stroke, including shoulder pain. However, the design of the current study was not prospective; thus, this hypothesis could not be tested in the current cross-sectional study.

Pain and sleep disturbances interact in complex ways that can affect an individual's behavioral and biological well-being.[38] Pain in the body can often negatively affect the sleep and daily activities of individuals. Individuals with chronic pain or depression and elderly individuals, are more likely to experience chronic insomnia, sleep maintenance problems, and/or non-restful sleep. It has been reported that proper recognition and management of sleep disorders can alleviate other symptoms and help cut this vicious circle.[39] Similar to the literature, we found that one of the determinants of depression was sleep quality. It is reported that patients with lesions in the shoulder area suffer from poor sleep quality.[40] However, in the present study, it was found that the scores obtained from the PSQI scale were similar between those with and without a diagnosis of HSP. In addition, in the logistic regression analysis performed to elucidate factors affecting sleep quality, no factor was found to be associated with sleep quality. In a study by Küçükdeveci et al., it was reported that sleep disturbances were more common in stroke patients with shoulder pain.[41] Furthermore, Korkmaz et al. reported that poor sleep quality was a risk factor that could be directly traced to HSP.[35] It should be noted that both sleep quality and pain are parameters that are evaluated by self-reporting, in addition to this, our study population was comprised of patients with considerably advanced age. Therefore these two factors could have caused the current results. Additionally, since we included patients who had applied to our center themselves, it is also arguable that these individuals may have had worse complaints in terms of sleep and quality of life which would have increased the likelihood of applying to a healthcare institution –causing a similar distribution of factors that were influential on quality of life.

Social support can be viewed as an underlying system where an individual is cared for, loved, respected by others and is a member of a network of mutual obligations. On the other hand,

family support is an interconnected, emotional and mental support system among family members.[42]

Conclusion

No relationship was found between having shoulder pain and age, gender, family support, ambulation status, depression, and sleep quality. It was found that patients with shoulder pain had significantly worse motor functions in patients diagnosed with hemiplegia.

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