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Research Article

Evaluation of Shoulder Pain, Depression and Sleep Quality in Hemiplejic Patients

Seide Karasel*

Department of Physical Medicine and Rehabilitation, Famagusta State Hospital, Famagusta, Cyprus

ABSTRACT

Background: The aim of the study was to evaluate Hemiplegic Shoulder Pain (HSP), depression and sleep quality in hemiplegic patients.

Methods: The research is a cross-sectional study conducted between 2018-2019 in Famagusta State Hospital. In the scope of the study, patients with hemiplegia who applied to the physical therapy and rehabilitation clinic were included consecutively. Clinical evaluations of the patients were performed and the parameters examined were as follows: age, gender, duration of hemiplegia diagnosis (weeks), education level, shoulder pain, Computerized Tomography (CT) results, family support status, and antidepressant, anxiolytic and antipsychotic drug use. The Pittsburgh Sleep Quality Index, Brunnstrom motor staging, Functional Ambulation Categories, Beck Depression Inventory were also applied to the patients.

Results: The frequency of HSP in the study group was found to be 20% (n=10). No relationship was found between having shoulder pain in patients diagnosed with hemiplegia and parameters such as age, gender, hemiplegia duration, education level, family support, CT result, depression, sleep quality, ambulation status, and the use of antidepressants, anxiolytics or antipsychotics. It was found that those with HSP had significantly worse motor functions. In the univariate logistic regression analysis performed to elucidate the factors affecting sleep quality, it was found that none of the factors examined had an effect on sleep quality. In the multivariate logistic regression analysis including age, female gender, lack of family support, worsening of Brunnstrom upper extremity, lower extremity and hand motor functions, poor ambulation and poor sleep quality (which were found to be effective on depression with univariate logistic regression analysis), the absence of family support and higher score from the sleep quality scale were found to be associated with higher level of depression.

Conclusion: As a result of the analyses, shoulder pain was not found to be associated with depression and sleep quality in hemiplegic patients. Lack of family support and poor sleep quality were the factors that independently increased the risk of depression in hemiplegic patients.

Keywords: Hemiplegia; Shoulder pain; Depression; Sleep; Stroke

INTRODUCTION

Cerebrovascular accident, or stroke, is not only a leading cause of death, but also accounts for a significant proportion of disability-adjusted life years [1]. Strokes occur when blood flow is suddenly impaired due to various reasons including pathologies in brain vessels. After a cerebrovascular accident, hemiplegia, usually characterized by loss of movement in one half of the body, can occur [2].Despite urgent interventions to correct or reinstate circulation and the use of surgical interventions, hemiplegia may not be curable in some patients. Hemiplegic patients often complain of motor, sensory, speech and walking problems [3].

Hemiplegic shoulder pain (HSP) is defined as musculoskeletal pain in the weakened shoulder of individuals with hemiplegia due to stroke [4]. It is a common complication of stroke with a prevalence varying between 5%–84% according to the severity and localization of stroke [5-9]. Although the onset of HSP can be as early as the first two weeks in some cases, it usually occurs after 2–3 months [10]. The typical clinical picture is usually in the form of severe paralysis on the plegic side, glenohumeral subluxation, pain radiating to the elbow and hand, and tenderness localized on the biceps brachii and supraspinatus tendons [7].

The development and progression of HSP is not limited to a single pathology, and in most cases, a multifactorial pain syndrome

Correspondence to: Seide Karasel, Department of Physical Medicine and Rehabilitation, Famagusta State Hospital, Famagusta, Cyprus, E-mail: karaselseide@yahoo.com

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emerges. Impingement syndrome, rotator cuff dysfunction, tendinopathy, bursitis, adhesive capsulitis, peripheral nerve injuries, complex regional pain syndrome, spasticity, central hypersensitivity and contractures are among the pathological conditions [11]. In a large literature review, the possible underlying pathologies for HSP were categorized in three groups: impaired motor control disorders (changes in muscle tone), soft tissue lesions, and changes in peripheral and central nervous activity. It has been reported that these pathologies may occur separately or simultaneously, or they may trigger each other and can continue to develop during the rehabilitation period [7].

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 [4]. Although pain in the human body is undoubtedly associated with physical conditions, it is also a physical and psychological stressor 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 [7].

The aim of the study was to evaluate shoulder pain, depression and sleep quality in hemiplegic patients, with a view to determine factors associated with the different aspects of HSP pathology.

METHODS

The research is a cross-sectional study conducted between 2018-2019 in Famagusta State Hospital.

Ethics committee approval and necessary permissions were obtained prior to the conduct of the study.

In the scope of the study, patients with hemiplegia who applied to physical therapy and rehabilitation clinic between 2018-2019 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). This index was developed by Buysse et al. and was adapted to the Turkish language by Ağargün et al. [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 scoresfrom 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].

Brunnstrom 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 15.0) statistics package program. The compliance of the data to normal distribution was evaluated using the Shapiro-Wilk test. Descriptive data were expressed as number, percentage, mean, and standard deviation, median, minimum and maximum values. Chi-square test and Mann Whitney U analyses were used in the comparison of categorical and quantitative variables, respectively. 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, 28 men and 22 women, and the average age of the patients was 70 ± 11.84 (20–86) 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 (72.5[55.0-85.0] years) and patients without HSP (72.0 [20.0-86.0]) were found to be similar (p=0.355). No significant difference was found between hemiplegia duration in patients with and without HSP (3.0[1.0-28.0] weeks *vs.* (4.5 [1.0-24.0]) (p=0.816). 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		Overall n(%)	p-value
	AbsentB n(%)	Present n(%)		
Gender				
Male	23(57.5)	5(50.0)	28(56.0)	0.669
Female	17(42.5)	5(50.0)	22(44.0)	
Education level				
Primary school and lower	31(77.5)	8(80.0)	39(78.0)	0.252
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)	0.259
Present	31(77.5)	6(60.0)	37(74.0)	
Computerized Tomography results				
Bleeding	5(12.5)	2(20.0)	7(14.0)	0.541
Ischemia	35(87.5)	8(80.0)	43(86.0)	
Use of antidepressants				
Absent	15(37.5)	5(50.0)	20(40.0)	0.47
Present	25(62.5)	5(50.0)	30(60.0)	
Use of anxiolytics				
Absent	38(95.0)	8(80.0)	46(92.0)	0.118
Present	2(5.0)	2(20.0)	4(8.0)	
Use of antipsychotics				
Absent	34(85.0)	9(90.0)	43(86.0)	0.684
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=0.089). 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		0.669	0.669
	Absent n(%)	Present n(%)		
FAC				
FAC 0-2	16(40.0)	7(70.0)	23(46.0)	
FAC 3-5	24(60.0)	3(30.0)	27(54.0)	0.089
Brunnstrom-upper limb				
Stage 3 or lower	16(40.0)	8(80.0)	24(48.0)	0.024
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)	0.045
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)	0.03
Stage 4 or higher	19(47.5)	1(10.0)	20(40.0)	

Abbreviations: FAC: Functional Ambulation Categories

The median scores of patients with and without shoulder pain on the PSQI (p=0.432) and BDI (p=0.330) 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)	0.432
BDI				
No depression / minimal depression, n(%)	9(22.5)	2(20.0)	11(22.0)	
Mild depression, n(%)	15(37.5)	3(30.0)	18(36.0)	
Moderate depression, n(%)	13(32.5)	4(40.0)	17(34.0)	0.952
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)	0.33

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).

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.

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	0.056	0.06	2.756	1.06 (0.99,1.13)	0.097	0.027	0.05	0.270	1.03(0.93,1.14)	0.604
Gender	1.658	0.62	7.107	5.25(1.55,17.77)	0.008	0.746	0.93	0.646	2.11(0.34,13.00)	0.422
0.684	-2.698	0.85	10.000	1.03(0.96, 1.11)	0.396					
0.684	-1.715	0.63	7.455	0.07(0.01,0.36)	0.002	-4.047	1.81	4.986	0.02(0.00-0.61)	0.026
0.684	-1.086	0.60	3.318	0.18(0.05,0.62)	0.006	-3.094	6.20	0.249	0.05(0.00-8506.89)	0.617
0.684	-1.232	0.63	3.790	0.34(0.11,1.09)	0.069	-3.318	2.61	1.460	23.39(0.14-3890.23)	0.227
0.684	-2.308	0.67	11.819	0.29(0.08,1.01)	0.052	4.023	6.26	0.413	55.87(0.00-11813)	0.520
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)	0.120
0.684	0.185	0.08	5.789	1.50(0.37,6.03)	0.568					
0.684	0.684	0.684	0.684	1.20(1.03-1.40)	0.016	0.258	0.12	4.329	1.29(1.02,1.65)	0.037

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

Worldwide, HSP frequency after stroke was reported to be between 5%–84% in several studies [5-9]. 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 [7,24].In some previous studies, it was reported that the age of patients diagnosed with HSP was significantly higher than those without HSP[22, 23, 25].However, there are also studies reporting that there is no relationship between age and HSP [21, 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 [21,23,26,28, 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 [26,32].With regard to functional characteristics, two studies using Brunnstrom staging have reported that motor function stage was significantly worse in patients with HSP [22,23]. 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 [21,28].

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 [27,28,32,35]. 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 [42,43]. It has been reported that the recovery process is easier for depressed individuals with a higher level of family support [44]. At the other end of the spectrum, it is reported that when social support decreases, the onset of depressive symptoms is earlier, the level of depression is higher, recovery takes longer and the tendency for chronic depression increases [45-48]. In the current study, we found that lack of family support predicts an increase in depression level, which supports this prior data.

LIMITATIONS

The study has some limitations. One of them is that the research was designed as a cross-sectional analysis of individuals that had applied to our center. In a prospective study, the causality of the relationships between HSP, depression and sleep quality could be revealed more clearly. Another limitation of our study is the small number of cases examined in the study group and the majority of them being individuals that had very advanced age. Another limitation is that the study was conducted with patients followed only in a single clinic which greatly limits generalizability. Other limitations include the lack of quantification of pain levels (such as with the Visual Analog Scale) and that the underlying pathologies for HSP were not evaluated. Nevertheless, this study is valuable in terms of the assessment of the relationships between HSP, sleep quality and depression in hemiplegic patients.

CONCLUSION

The frequency of HSP in the current study group was 20% in patients who had hemiplegia. 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. None of the factors analyzed were determined to affect sleep quality in hemiplegic patients. However, the absence of family support and poor sleep quality were found to predict high depression levels. It can be said that attempts to improve motor functions among individuals with hemiplegia will reduce shoulder pain, which could contribute to

reduced depressive symptoms in the presence of increased family support and higher sleep quality. It was concluded that more comprehensive prospective studies evaluating HSP, depression and sleep quality in patients with hemiplegia would be useful.

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