Original Article

Level of Functional Impairment using Symptom Severity and Functional Status Scales in Patients with Carpal Tunnel Syndrome

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Abstract

Background: Carpal tunnel syndrome occurs when median nerve is entrapped or compressed causing paresthesia and sometimes pain in patients' hands, this can result in functional impairments and disability. **Objective:** To evaluate the level of functional impairment using symptom severity and functional status scales in participants with this syndrome. **Methods:** An observational study was conducted on 150 patients with carpal tunnel syndrome by using non-probability purposive sampling and collecting data from various private and government hospitals of Lahore in six months from October 2020 to March 2020. The level of functional impairments was evaluated by using functional status and symptom severity scale. **Results:** Findings showed that 62% were females and 38% were males. According to Boston carpal tunnel questionnaire score most of the patients had moderate symptoms (39.3%) with the mean of 2.97 and mild functional limitations (42%) with the mean of 2.34. **Conclusion:** It was concluded that mild and moderate mean values were found by using functional status and symptoms severity scale respectively. There is existence of correlation between symptom and functional severity scales among patients with this syndrome.

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Keywords: carpal tunnel syndrome; functional Impairment; functional status scale; symptom severity scale

Introduction

The term 'carpal tunnel syndrome' (CTS) was initially used in 1939, but in medical terms it was firstly noted in early 20th century[1]. Carpal tunnel syndrome occurs when median nerve (MN) is entrapped or compressed as it travels through middle of flexor retinaculum and carpal bones in hand.[2] That MN moves up to 9.6 mm and allows wrist flexion and extension to some extent as CTS is most common nerve compression syndrome.[3] The MN entrapment in carpal tunnel produces numbness and sometimes pain in patients. These symptoms felt in first three fingers as well as radial side of ring finger as these zones are innervated by MN. These symptoms can be felt in one or both hands however some studies prove that bilateral manifestation is much frequent then unilateral.[4] As soon as CTS progressed, the symptoms remain throughout day and worse due to heavy activity. Once the nerve compresses for longer

duration, the nerve degeneration and thenar atrophy occurred. Incidence of CTS in general population is about 3 to 6%.[5] Hand functioning comprises of all fine motor skills of hand and thumb, although, human hand kinematics is very complex due to involvement of high number of degrees of freedom.[6] Functional impairments are very common in this syndrome, may be caused by overuse of hand and wrist joint[7] and it is assessed by Boston carpal tunnel questionnaire (BCTQ) is a disease specific measure of self-reported severity of symptoms and functional activity. The pathogenesis of CTS consists of numerous risk factors like mechanical, neurological or ischemic injury, biochemical and inflammatory changes.[8]

In most instances, it is idiopathic but most important factors comprise of obesity, mainly in younger generation and those pathologies affecting the synovium can cause secondary CTS. Approximately about 2.3% to 4.6% of these patients are pregnant women, about 50% of all pregnant women have nocturnal hand symptoms mostly in 3rd trimester. Hormonal changes and edema and gestational diabetes are the main causes of this syndrome.[9] The occupational risk factors are also most significant risk factors to trigger neuropathy, especially that involves repetitive movements of hand.[10] Thus, CTS is also considered as an occupational disease.[11] This syndrome involves both occupational and non-occupational risk factors.[12] Seasonal variation has impact on CTS, there is high frequency during winters and little frequency during summers and vice versa.[13]

Hypothyroidism may be associated with this suyndrome.[14] The palmar fascia contains palmaris tendon insertion that is positioned in close association with transverse carpal ligament. Loading of this tendon results in increasing carpal tunnel pressure that can be diagnosed by clinical picture, Phalen's test and nerve conduction studies (NCS) having 42-85% sensitivity and 54-98% specificity.[15,16] This disorder can be treated surgically or conservatively by use of corticosteroids or splinting, although evidence proves that steroid injections and splinting have short-term effects.[17] Surgical release for those patients who are not gaining relief by conservative treatment and having moderate to severe symptoms is proven to be very effective[18]. Thus, both treatments are beneficial for CTS patients[19]. Recent studies stated that patients having CTS of mild to moderate level reported mild symptoms and functional impairments while those patients having severe disease reported mild symptoms but severe functional limitations of hand.[15] The purpose of current study is to explore the level of functional impairments in participants with CTS by assessing hand functioning through BCTQ using both symptom severity (SSS) and functional status scales (FSS).

Methods

This cross-sectional designed study conducted during duration of six months in participants clinically diagnosed with carpal tunnel syndrome after approval from hospital. Sample size was estimated by using formula $n = \frac{z^2_{1-a/s}\ P(1-P)}{d^2}$ where r=0.29, α=0.05, β=0.10, n=150. The data was collected from various government and private sectors of Lahore and patients were assessed with BCTQ. Inclusion criteria involves diagnosed cases of CTS, both genders, age ranged between 25-55 years and exclusion criteria involves patients with rheumatic arthritis, cognitive impairment, patients with liver impairment, and smokers.

First consent form was given to patients then data was collected by filling the questionnaire that consists of two parts, first part deals with FSS that assess how symptoms affect patients, while second part consisted of SSS that assess severity, frequency, time and kind of symptoms that affects daily living. The FSS consists of eight questions to assess functional activity about household chores and self-care like buttoning clothes, writing, holding book while reading, gripping handle of telephone, jar opening, carrying bags, dressing and bathing.

There are five difficulty levels of each activity in level II indicates mild difficulty, level III indicates moderate difficulty, level IV indicates severe difficulty and level V means that patient is completely unable to do activity due to severe symptoms of hand and wrists.

The SSS comprises of eleven questions that addresses pain severity in hand or wrist during night, sleep disturbance due to hand or wrist pain, hand or wrist pain during day time, severity of pain during day time, duration of pain during daytime, numbness in hand or wrist, muscular weakness of hand or wrist, any tingling sensations, severity of numbness during night, sleep disturbance, difficulty while holding and use of small objects. Each question comprises of five levels that arrange in increasing order of symptoms severity in which level I means no symptoms, in level II mild symptoms, level III moderate symptoms, level IV intense symptoms and level V most severe symptoms. The data was analyzed by using statistical package for this scale in which level I indicates no difficulty, social sciences (SPSS) version 23.0. The variables were presented in the form of descriptive statistics (graphs, tables and percentages). Pearson correlation was also calculated to find association between symptom severity and functional severity scales among patients with CTS.

Results

Out of 150 patients with CTS, 38% were males and 62% were females. Among patients with this syndrome, 1.33% were asymptomatic, 39.33% were having mild symptoms, 35.34% were with moderate symptoms, 14% with severe symptoms while 10% were with very severe symptoms (Table-I). Most of the patients have mild to moderate symptoms while some have severe symptoms. There is strong correlation between symptom severity and functional severity scores and p-value is 0.000 which is considered significant, as shown in Table-II.

Table-I: Frequency of severity of symptoms

Symptoms	Frequency	Percent	BCTQ Score
Asymptomatic	2	1.33%	11
Mild	59	35.34%	12-22
Moderate	53	39.33%	23-33
Severe	21	14.0%	34-44
Very severe	15	10.0%	45-55
Total	150	100%	11-55

Table-II: Pearson Correlation of symptom severity and functional severity scales

Scales		Symptom severity	Functional severity
Symptom severity	Pearson Correlation	1	.954**
	Sig. (2-tailed)	.000	.000
	N	150	150
Functional severity	Pearson Correlation	.954**	1
	Sig. (2-tailed)	.000	.000
	N	150	150

***Correlation is significant at the 0.01 level (2-tailed).*

Discussion

The current study is designed to explore the level of functional impairments in subjects with CTS by assessing hand functioning through BCTQ using both symptom severity and functional status scales. Out of 150 patients with CTS, 38% were males and 62% were females. Among patients with this syndrome, 1.33% were asymptomatic, 39.33% were having mild symptoms, 35.34% were with moderate symptoms, 14% with severe symptoms while 10% were with very severe symptoms (Table-I). There is strong correlation between SSS and FSS scores (p:0.00) thus proves that probability is low. In a study conducted by Mody G[20], in India, the BCTQ was used and concluded that both scales lie in mild category however according to current study by using same questionnaire, the symptom severity lie in moderate category and functional severity lie in mild category.

Another study by Tang C[21], measuring long-term consequences of carpal tunnel release surgery in patient with CTS. The mean score for SSS was 1.1 and for FSS, it was 1.15 which was measured by BCTQ while in present study the mean score for SSS is 2.97 and for FSS is 2.34. A study conducted by Weerasinghe *et al.* in 2018[22] to assess functional limitation and symptom severity and correlate neurophysiological findings with BCTQ, in which they recruited 147 patients and concluded that symptoms and functional scores had no correlation with the severity of CTS grading while in our study among 150 patients symptoms and functional scores had correlation with this grading.

Conclusion

It was concluded that mild and moderate mean values were found by using functional status and symptoms severity scale respectively. There is existence of correlation between symptom severity and functional severity scales among subjects with carpal tunnel syndrome with existence of Pearson correlation between symptom severity and functional severity.

Declarations

Consent to participate: Written consent had been taken from patients. All methods were performed following the relevant guidelines and regulations.

Availability of data and materials: Data will be available on request. The corresponding author will submit all dataset files.

Competing interests: None

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