



Effectiveness of Fear, Anxiety and Depression on Functional Ability in Patients with Spinal Cord Injury

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Abstract:

Introduction: The spinal cord is the major conduit through which motor and sensory information travels between brain and body. Spinal cord injury (SCI) affects conduction of sensory and motor signals across the site of lesion¹⁹. SCI is a low- incidence, high cost disability requiring tremendous change in an individual's life-style²⁵.

The consequence of SCI is usually permanent paralysis of voluntary muscles below the lesion, reduced mobility, impairment of social and vocational activities, with a negative impact on body systems such as respiratory, cardiovascular, urinary, gastrointestinal, reproductive and sensory.¹⁹ When a sudden-onset spinal cord injury (SCI) occurs, there are often multiple levels of trauma to address, including acute medical issues, new functional limitations, psychological reactions (*e.g.* anger, anxiety, depression, and denial about the permanency of the condition)that persists for months or years , distressing memories related to the traumatic event causing the SCI, and possible role changes caused by the SCI.

Growing evidence suggests psychological factors such as anxiety, fear, and depression may also relate to physical function in patients with SCI. The psychological variables of fear, anxiety, and depression can be associated with each other, and therefore it may be possible that they could interact to have a greater effect on physical function.³

Objective: To study effectiveness of fear, anxiety and depression on functional ability in patients with spinal cord injury

Research Design: Correlational design

Methodology: On the first visit, a detailed examination of subjects was done and the subjects found eligible on the basis of inclusion and exclusion criteria, were explained about the study and were requested to sign the informed consent for seeking their willingness to participate in the study. Out of 153 subjects of SCI who volunteered for this study, 100 subjects were included in the study after they met the inclusion criteria. Subjects were assessed for various psychological variants via Depression, Anxiety and Fear-avoidance beliefs.

Result: Depression was the most highly associated variable for physical function in Regression model meaning that depression highly affects physical performance in Spinal Cord Injury Patient. The results also revealed significant associations between each psychological variable and all the measures of

function. High levels of fear avoidance beliefs, anxiety and depression were associated with reduced self-reported measures

Conclusion: An important aspect of this study is that it has specifically examined the effect of some elements of psychological variants (depression, anxiety and fear avoidance beliefs) on physical function in chronic SCI patients. Higher psychological variants are significantly and independently related to poorer physical function in bivariate correlation model. In addition, depression has been found to be the strongest factor among all the psychological variants that have a great association with performance based measure of physical function.

Keywords- SCI, anxiety, depression, psychological variables, rehabilitation

Introduction:

The spinal cord is the major conduit through which motor and sensory information travels between brain and body. Spinal cord injury (SCI) affects conduction of sensory and motor signals across the site of lesion¹⁹. SCI is a low-incidence, high cost disability requiring tremendous change in an individual's life-style²⁵. The consequence of SCI is usually permanent paralysis of voluntary muscles below the lesion, reduced mobility, impairment of social and vocational activities, with a negative impact on body systems such as respiratory, cardiovascular, urinary, gastrointestinal, reproductive and sensory.¹⁹ When a sudden-onset spinal cord injury (SCI) occurs, there are often multiple levels of trauma to address, including acute medical issues, new functional limitations, psychological reactions (*e.g.* anger, anxiety, depression, and denial about the permanency of the condition) that persists for months or years, distressing memories related to the traumatic event causing the SCI, and possible role changes caused by the SCI.

Growing evidence suggests psychological factors such as anxiety, fear, and depression may also relate to physical function in patients with SCI. The psychological variables of fear, anxiety, and depression can be associated with each other, and therefore it may be possible that they could interact to have a greater effect on physical function.³

Depressed mood accompanied by persistent and pervasive loss of emotional involvement with

other people, objects, or activities distinguishes a normal mood state of sadness, demoralization, or other negative effects such as anxiety from the syndrome of depression¹. Depressive disorders range in severity from minor depression and adjustment disorders to major depressive episodes, depending on the number, type, and pervasiveness of symptoms, their duration, and their effect on function⁶. Symptoms uniquely predictive of Major Depressive Disorder for persons with SCI include psychomotor disturbance, appetite change, and sleep disturbance¹. Rates of depression have been estimated to range from 20% to 43% when the person with SCI is attending rehabilitation as an inpatient. Risk of depressive symptoms such as depressive mood and anxiety after discharge from rehabilitation has been estimated to be around 15% up to 50-60%²¹. Patients who exhibit more depressive behavior tends to expect a longer hospitalization and in turn evidence lower levels of functional independence and mobility at discharge than those without these problems¹. These complications occur at high cost to the person, the rehabilitation program, and the community. Depressive symptoms have been associated with increased stays in hospital, fewer functional improvements in SCI rehabilitation, and increased mortality and morbidity⁴.

Fear is an emotional reaction to a specific, identifiable threat that may increase sympathetic nervous system arousal and induce defensive or escape behavior to remove the specific threat.

Fear contributes to fear avoidance belief³. In this, person interprets pain as a non adaptive response and pain is perceived as threatening which leads to maladaptive behaviors including pain-related fear, avoidance, and hyper vigilance. Fear is thought to lead to avoidance of activities believed to be painful or harmful, which may lead to increased disability through the detrimental effects of physical inactivity and weakening of the musculoskeletal system. Various studies indicate that fear avoidance beliefs can be modified during the course of rehabilitation to improve treatment outcome.

In a study following SCI patients from rehabilitation to reintegration within the community, anxiety rates ranged from 10%–60%, with the highest rates occurring right before initial discharge⁵. Anxiety is similar to fear in that it is also an emotional reaction associated with a heightened state of arousal, but the focus of the threat is unclear. Anxiety may induce more preventive behaviors such as avoidance of situations that the person might anticipate could be potentially threatening or anxiety-producing. Anxiety may account for some variation in reported pain and therefore affect perception of function. In the long term, these behaviors may result in increased disuse and disability, which further decreases the opportunity to disprove the fear of movement and fear of pain. The felt emotion of these patients is of great interest, because the proportion of the body's sensory mechanism disconnected from the brain varies among them²⁴.

Therefore, functional performance and the emotional states of depression, anxiety, and stress as rehabilitation outcomes, are important issues for rehabilitation professionals involved in service delivery⁷. A reduced physical capacity is an important detriment of the health status of SCI patients because it exposes them to increased risk of complications and is related to decreased level of functioning and QOL. Specific training and follow-up programs should explore the differences in order to help each patient develop

his or her maximum potential physical capacity. Research also suggests that risks of negative psychological states remain high unless SCI individuals receive effective treatment such as cognitive behaviour therapy during rehabilitation. Several studies have identified and characterized patterns of adjustment to SCI and to chronic pain.²⁵ Clinical experience reveals wide variations in how and how well people with SCI adjust and accommodate to their symptoms and functional limitations²⁵.

So, the present study addresses to find out effect of depression, anxiety and fear-avoidance belief on physical function in spinal cord injury patients.

To explore whether fear, anxiety and depression are associated with physical function in spinal cord injury patients and interaction among these factors.

Methodology

Study Design

Correlational design

Sample

Sampling was done by convenience sampling method. 100 subjects (27 females and 73 males) having Traumatic onset SCI with age group ranging from 18 to 30 years were included in the study.

Source Of Subjects

Subjects were recruited from Indian Spinal Injury Center, Delhi

Inclusion Criteria

- Traumatic onset of SCI.
- Chronic i.e. ≥ 1 year post SCI.
- Paraplegia, motor complete.
- Age: 18 to 30 years.
- Level: T2- L/S levels.
- Permanent neurological loss.

- Ability to rise from sitting to standing (using upper extremity support) and stand for at least 1 minute.

Exclusion Criteria

- Transverse Myelitis
- CaudaEquina
- Spinal Stroke
- Spinal Tumours
- Arteriovenous Malformation
- Cavernous Malformations
- Central Cord Syndrome
- Brown-Sequard Syndrome
- Anterior Cord Syndrome
- Posterior Cord Syndrome
- GullianBarre Syndrome
- Sacral Sparing
- Spina Bifida
- Polio
- Associated head injury.
- History of dementia and delirium.
- Other neurological conditions.

INSTRUMENTATION

- Scales for assessing psychological variants
- Parallel bar



Procedure

On the first visit, a detailed examination of subjects was done and the subjects found eligible on the basis of inclusion and exclusion criteria, were explained about the study and were requested to sign the informed consent for seeking their willingness to participate in the study.

Out of 153 subjects of SCI who volunteered for this study, 100 subjects were included in the study after they met the inclusion criteria.

Subjects were assessed for various psychological variants via Depression, Anxiety and Fear- avoidance beliefs.

Results

All 100 subjects (73 males, 27 females) successfully completed the study. Mean age of the females was 27.55 ± 5.31 yrs and the mean age of males was 25.35 ± 4.38 yrs. Descriptive statistics of group characteristics have been summarized in Table 5.1.

Results for psychological variants of study population were as follows:

Scores of BDI for males and females were found to be 26.06 ± 7.94 and 35.22 ± 10.08 respectively. Similarly for STAI-S, scores were found to be 38.25 ± 6.55 and 44.88 ± 8.57 for males and females respectively. For FABQ-PA, scores were 8.83 ± 5.63 and 14.88 ± 7.28 for males and females respectively (Table 5.2).

Results for measures of physical function of study population were as follows:

Scores of SCIM for males and females were found to be 65.51 ± 6.33 and 58 ± 7.43 respectively. Similarly for WISCI, scores were found to be 9.12 ± 3.68 and 5.66 ± 3.42 for males and females respectively (Table 5.3).

These results indicate that females with SCI perceived significantly greater psychological variables and had lower physical function as compared to males with SCI.

The results also revealed significant associations between each psychological variable and all the measures of function. High levels of fear avoidance beliefs, anxiety and depression were associated with reduced self- reported measures (Fig.5.1, 5.2, 5.3). These psychological variants also correlated well with the performance- based measure of function as illustrated in the graphs (Fig.5.4, 5.5, 5.6), (Table 5.4).

Bivariate correlation indicated that females had a higher significant association between each psychological variable and all the measures of function as compared to males. (Table 5.5 and Table 5.6)

The results of linear regression on SCIM indicated the following findings (Table 5.7):

- Higher depression (higher BDI scores) and fear avoidance beliefs (higher FABQ-PA scores) were significantly associated with worse function (lower SCIM scores).
- BDI × FABQ-PA interaction was significantly associated with SCIM.

- Worse physical function (lower SCIM scores) was related to the interaction between anxiety and fear –avoidance beliefs.

The results of linear regression on WISCI indicated the following findings (Table 5.7):

- Worse physical function (lower WISCI scores) was related to higher depression.
- None of the interactions were significantly associated with the performance- based measure of function.

Depression was the most highly associated variable for physical function in Regression model meaning that depression highly affects physical performance in Spinal Cord Injury Patient. (Table 5.7)

Table 5.1: Descriptive Statistics of the study population.

AGE	MEAN AGE : FEMALES-27.55±5.31yrs MALES- 25.35±4.38yrs
GENDER	MALES (n=22) FEMALES (n=8)

Table 5.2: Psychological Variant scores of SCI patients.

	Gender		t	Df	p
	Males	Females			
BDI	26.06±7.94	35.22±10.08	2.3558*	10.6	0.038
STAI-S	38.25±6.55	44.88±8.57	2.14*	10.9	0.05
FABQ-PA	8.83±5.63	14.88±7.28	2.29*	10.9	0.04

* Significant at $p \leq 0.05$

Table 5.3: Physical function scores of SCI patients.

	Gender		t	Df	p
	Males	Females			
SCIM	65.51±6.33	58±7.43	-2.75*	11.6	0.017
WISCI	9.12±3.68	5.66±3.42	-2.62*	13.9	0.02

* Significant at $p \leq 0.05$

Table 5.4: Bivariate correlation between Psychological variants and measures of function in both genders of SCI patients.

	SCIM		WISCI	
	r	P	r	P
BDI	-0.97**	0.0001	-0.94**	0.0001
STAI-S	-0.93**	0.0001	-0.91**	0.0001
FABQ-PA	-0.97**	0.0001	-0.91**	0.0001

** Highly significant at p< 0.01

Table5.5: Bivariate correlation between Psychological variants and measures of function in females.

	SCIM		WISCI	
	r	P	r	P
BDI	-0.99**	0.0001	-0.95**	0.001
STAI-S	-0.99**	0.0001	-0.93**	0.0001
FABQ-PA	-0.98**	0.0001	-0.94**	0.0001

** Highly significant at p< 0.01

Table5.6: Bivariate correlation between Psychological variants and measures of function in Males.

	SCIM		WISCI	
	r	P	r	P
BDI	-0.96**	0.0001	-0.95**	0.001
STAI-S	-0.89**	0.0001	-0.90**	0.0001
FABQ-PA	-0.96**	0.0001	-0.89**	0.0001

** Highly significant at p< 0.01

Table 5.7: Regression model on physical function measures.

VARIABLES		Y	P
SCIM	BDI	-0.329**	0.001
	STAI-S	-0.043 ^{NS}	0.615
	FABQ-PA	-0.591**	0.0001
WISCI	BDI	-0.319**	0.001
	STAI-S	-0.052 ^{NS}	0.56
	FABQ-PA	-0.049 ^{NS}	0.63

NS- Not significant

** Highly significant at p< 0.01

Y-Regression

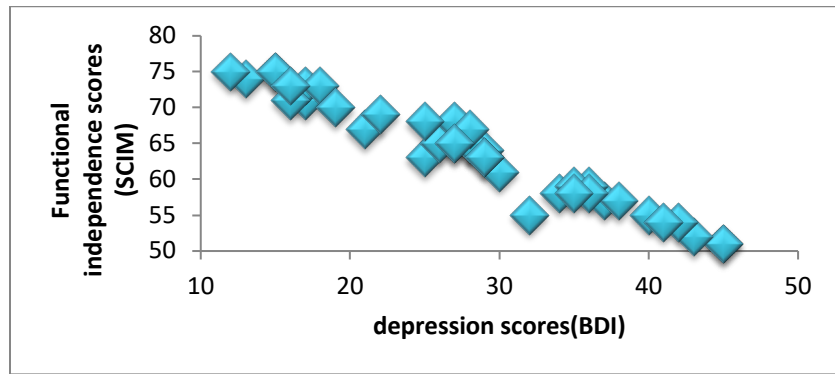


Fig.5.1: Correlation of depression (BDI) and functional independence (SCIM)

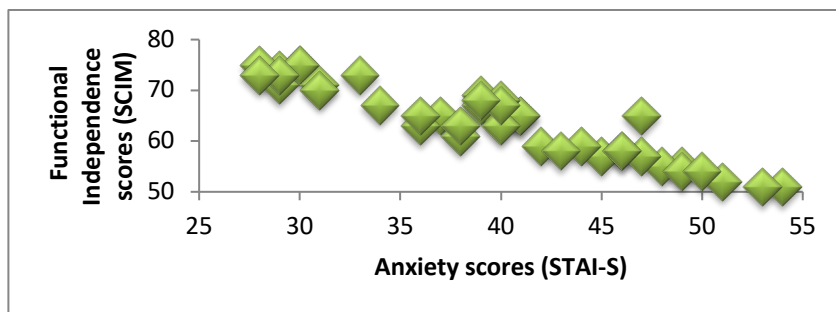


Fig.5.2: Correlation of anxiety (STAI-S) and functional independence (SCIM)

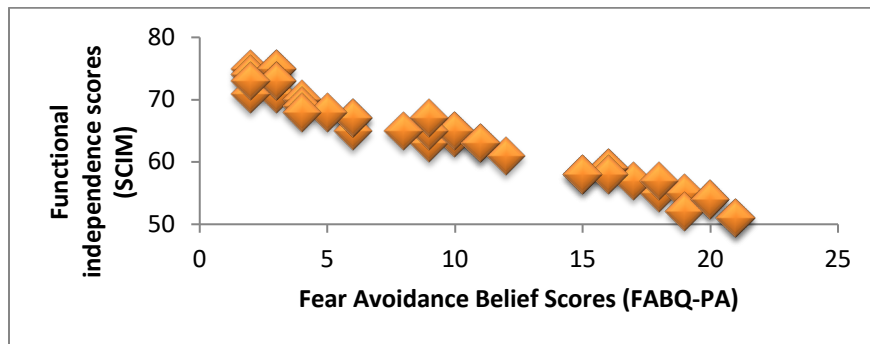


Fig .5.3: Correlation of fear avoidance beliefs (FABQ-PA) and functional independence (SCIM)

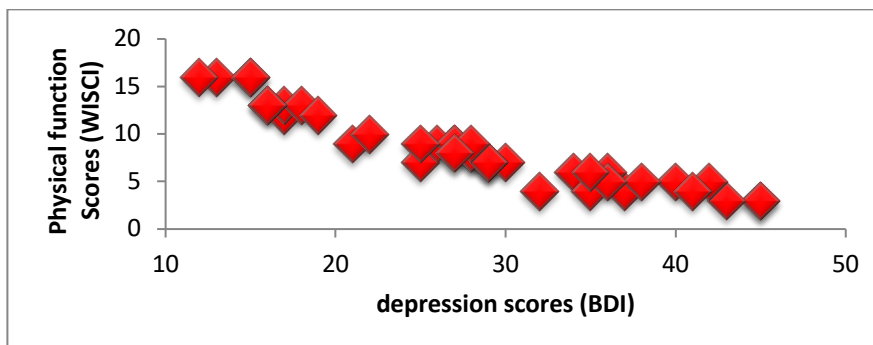


Fig.5.4: Correlation of depression (BDI) and physical function (WISCI)

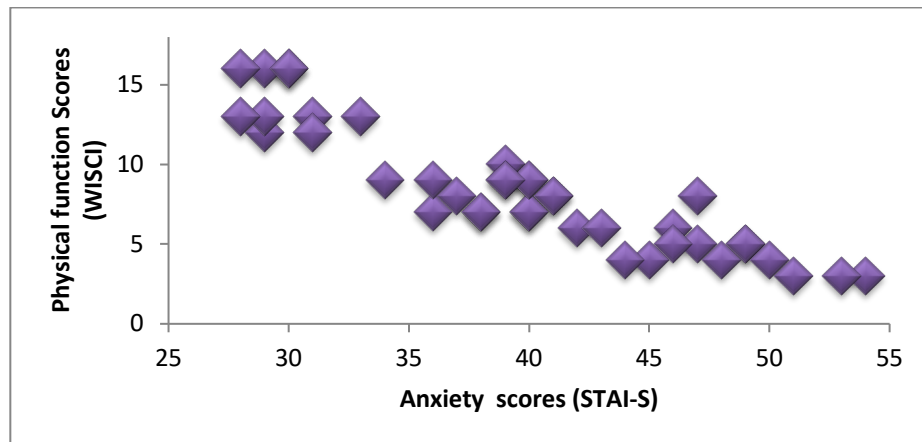


Fig.5.5: Correlation of anxiety (STAI-S) and physical function (WISCI)

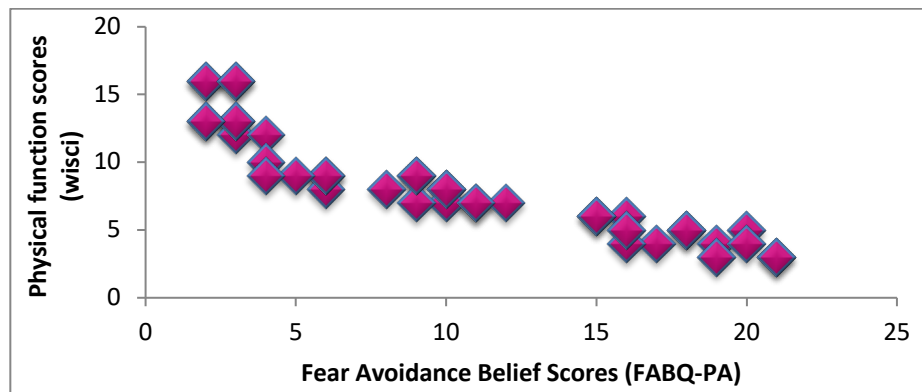


Fig.5.6: Correlation of fear avoidance beliefs (FABQ-PA) and physical function (WISCI).

Discussion

The primary findings of this study support the proposed hypothesis that depression, anxiety and fear-avoidance beliefs are significantly associated with physical function in SCI patients. Higher depression, anxiety and fear-avoidance beliefs are independently related to poorer function as shown in bivariate correlation model.

The association of higher anxiety with worse function is in concordance with prior literature and supports the importance of addressing anxiety in addition to physical impairments in the assessment of patients with SCI. A postulated model explanation for anxiety's role in determining function is via a cognitive mechanism in which emotional experience can trigger the experience of symptoms and perceived function or the converse, in which the

experience of symptoms and perceived function can trigger emotional reaction.¹³

Anxiety was not significantly associated in any of our models of physical function i.e. self-report measure and performance based measure in regression model. Surprisingly our bivariate correlation showed contrasting results (anxiety was significantly associated with physical function).

Pain has a significant impact on activities and is associated with a reduction in global self-rated health and higher levels of psychologic distress.⁹

The experience of pain could predispose to psychologic distress, which lead to potential amplification of pain experience. Psychological variables may account for some variation in reported pain and therefore affect perception of function. A behavioral mechanism, has been

proposed whereby an emotional or catastrophising anticipation of pain increases the tendency to avoid activities believed to be pain-related, which plays into cycle of less activity, muscle weakness and vulnerability of patient to more disability. Consistent with the prior literature in low back pain, in the present study a significant relation of higher fear-avoidance beliefs and worse physical function was found.

Eva G. Widerstrom et al (2001) in their study listed that similar extent of pain interferences in various areas of activity is related to clinical symptoms of pain as well as to psychological factors. The relationship between frequent interference and pain intensity indicates that individuals experiencing several types of pain of high intensity are more likely than others to experience frequent interference with a variety of daily activities.¹¹

Relationship of pain and depression develops over time. Reduced pain will have a greater effect on reducing depression than decreased depression will have on pain.¹³

In addition to above stated Psychological variables in the present study, anxiety and fear avoidance beliefs are not significantly related to the performance-based measure of function in regression model. With the proposed decreased activity present in the fear avoidance model, we expected that we might see a relationship between fear avoidance beliefs and actual physical tasks via having more than one performance based measure in the study.

Depression has been found to be the most important prevalent factor associated to physical function in the current study. Similar results have been found by Rosemary B. Hughes (2001) that greater severity of physical disability is associated with greater risk of depression.¹⁹

Similarly Paul Kennedy et al (July 2000) in their study reported that functional independence was found to be negatively correlated with depression.

Interestingly our study also surpassed the 30% estimation for major depression which previous studies had quoted. According to our findings, the rate of major depression was 40%.³

The high rates of depression in this study may reflect several factors:

The study used BDI to measure depression as it is most sensitive measure with sensitivity of 83.3% and specificity of 90.8% as reported by the previous studies reviewed by Claire Z. Kalpakjian et al (2009).

Increased depression can be explained by people becoming more dependent and lacking social supports external to the family, such as work opportunity, especially on returning home after institutional rehabilitation.⁷

Depressive symptoms were found to be positively correlated with gender. Psychosocial factors, especially stress and social isolation appeared to play a more potent role in the depression of women with SCI than disability related or demographic factors.

The lack of reduction in depression and anxiety in SCI group may well be related to the daily frustration associated with ongoing physical difficulties resulting from SCI. To assume that 'time heals' may be denying the complex processes involved with adjusting to SCI.⁶

The possible reason for the highly significant results of this study could have been the excellent reliability and validity of the scales chosen such as BDI (had a sensitivity of 83.3% and specificity of 90.8%), STAI-S (Intra class correlation coefficient was high, ICC= 0.39 to 0.89), FABQ-PA (the intraclass correlation coefficient was .66 and the internal consistency was .79), SCIM (correlation coefficient rate 0.66—0.98), WISCI (Intra-rater reliability was 0.97).

Significance of the study

The current study findings point to the need for assessing psychological variants among

individuals with SCI. Clinician should assess and gather best treatments that can reduce psychological states in SCI. This may then reduce the prevalence of these psychological variants in the long term by assisting the person with SCI to maintain a healthy mental health and adjustment. For fear avoidance beliefs, interventions should be designed to disconfirm the belief that engaging in physical activities will be harmful to the subjects. The outcome of this study could potentially guide clinical decision making regarding to first manage the psychological variants and then go for other therapeutic intervention in spinal cord injury patients

Conclusion

An important aspect of this study is that it has specifically examined the effect of some elements of psychological variants (depression, anxiety and fear avoidance beliefs) on physical function in chronic SCI patients. Higher psychological variants are significantly and independently related to poorer physical function in bivariate correlation model. In addition, depression has been found to be the strongest factor among all the psychological variants that have a great association with performance based measure of physical function.

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