



## Impact on Voice after Cervical Spinal Cord Injury

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### Article Information

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### Abstract:

Spinal Cord Injury (SCI) is a major cause of disability and morbidity throughout the world and Asia. The association between CSCI and voice difficulties is clinically well-recognized. So this study was meant to determine the impacts on voice following CSCI. The study aimed to determine the impacts on voice following Cervical Spinal Cord Injury (CSCI). Additionally includes finding out the proportion of voice difficulties among CSCI patients, to identify the number of functional, physical, and emotional impacts on voice after CSCI, and to determine the socio-demographic characteristics of the study population. This study was conducted by using a cross-sectional prospective survey method at the SCI unit of CRP. Participants were

selected by using purposive sampling. The result states from the research that CSCI is more common in males than females and nearly half of the person has physical, emotional, and functional impacts on voice after CSCI. Among participants, the maximum participants 22.5% (18) rated their voice problem at a moderate level (VHI=11-20) after CSCI and 11.3% (9) participants faced voice problems at a very severe level, 13.8% (11) participants had severe level voice problem. The association between surgeries happened or not happened and the severity of voice problems among CSCI patients showed statistically non-significant. Patients with cervical spinal cord injury faces several clinical problems in our country, whereas nearly most of them experience mild to moderate voice deficits secondary to poor respiratory support. In Bangladesh, Speech & Language Therapy services for SCI patients are newly introduced in the last few years. So for providing proper comprehensive services to SCI patients the monitoring of communicative function from the acute phase to the community reintegration phase is essential.

**Keywords:** *Impact, Voice, Cervical Spinal Cord Injury.*



## Introduction

Spinal cord injury (SCI) is a medically complex and life-disrupting condition. SCI is one of the most severe injuries which bring sudden and profound life changes that have global effects (Somers, 1992). World wide 20-40 people per million of the population acquire spinal injury every year. It is estimated that in the United States (US), each year 11,000 new cases of SCI and there are currently about 250,000 persons alive with SCI, because of a lack of functional improvements in medical care and survival (WHO, 2011). The prevalence of people with SCI has increased day by day and it is predicted that there will be a greater number of older patients with SCI (National Spinal Cord Injury Statistical Center, 2013). Currently, the average age of injury is 37.6 years and about 80% are male of those who are affected. The racial distribution appears to be changing between 1973 and 1979, where 76.9% were white and 14.2% were African American. Since 2000, 62.9% of those injured person have been white and 22% have been African American (Brown et al., 2006). There is no study conducted about the prevalence of SCI patients in Bangladesh but in India, 236 people per million populations have developed traumatic SCI every year (Furlan et al., 2014). The last annual report of the Center for the Rehabilitation of the Paralyzed (CRP) showed that from 2013-2014 there got admitted 388 patients with SCI of whom 88.4% were male and 11.6% were female (Annual Report of CRP, 2015).

SCI has a negative influence on the quality of life of a person with SCI because it leads to a high level of long-term disability, morbidity, and mortality and causes an overall economic burden on a family, society, and country (Razzak et al., 2011). SCI is a major health problem in Bangladesh due to its high morbidity and mortality rate (Hoque et al., 1999). There are three main causes of traumatic spinal cord injury in Bangladesh including road traffic crashes, falls, and violence (Bickenbach et al., 2013).

SCI refers to impairment or loss of motor and/or sensory function in the cervical, thoracic,

lumbar, and sacral segments of the spinal cord and the cervical spinal cord injury (CSCI) can result in long-standing changes in voice function and secondary to the respiratory impairment. Therefore, individuals with CSCI have a risk of voice fatigue, and that creates restrictions in communicative participation. At the least, changes in voice function can affect the enjoyment and social interactions with others (Johansson, 2013).

Voice difficulties following CSCI are an under-recognized complication that can lead to significant medical complications. Although, voice difficulties are most common with persons with neurological conditions (e.g.: stroke, head injury, Parkinson's disease, multiple sclerosis, etc.) and several studies has been conducted on voice difficulties in these conditions, but specifically, data on voice difficulties in patients with CSCI are limited in the world (Hoque et al. 2012). On the other hand, though the incidence of spinal cord injury is high, but there is no study that has been conducted earlier on the voice difficulty of patients with CSCI in Bangladesh, as a result, there is a lack of data in this area. As Speech & Language Therapy (SLTs) clinical services have been introduced in CRP since 2010 and speech therapy service is concerned with neurological conditions including voice difficulties, so for the promotion of the service relevant data in this field is required (Speech and Language Therapy, 2010).

## Materials and Methods

The study was prospective studies because here information was collected directly from the people studied (Hicks, 2009). It was a quantitative study because quantitative research is used to establish facts (Bailey, 1997). A cross-sectional study design was chosen to meet the aims of the study as cross-sectional studies examine a phenomenon at one point of time and the investigator studied the samples within approximately 3 months (DePoy & Gitlin, 1998). In this study, the survey method was used to collect data from people with CSCI through face-to-face interviews. So, it was suggested that

the survey method was the most applicable method to conduct the study, so the investigator used the cross-sectional prospective survey method (Stein & Citler, 2000; Fraenkel & Wallen, 2000). All people with cervical spinal cord injury are admitted in the SCI unit of the Centre for the Rehabilitation of the Paralyzed (CRP). 80 samples were selected based on inclusion and exclusion criteria. For conducting this study inclusion criteria were patients with CSCI who had a lesion in cervical vertebrae level C1-C7 (both acute and chronic phase) and exclusion criteria were People with CSCI with a history of any neurological condition (e.g.: Traumatic brain injury, stroke). Data were analyzed by descriptive statistics, calculated as percentages, and presented by using the table and bar graphs.

## Results and Discussion

In this study, 80 participants were selected who had CSCI where the majority of participants 88.8% (71) were male and other participants 11.3% (09) were female. Morpeth and Williams (2009) also revealed in a study that maximum participants (167) were males and the others were females out of 274 participants. So CSCI is more common in males than females.

Among the respondents, the maximum participants 28.7% (23) with CSCI were in the age range of 31-40 years, and the most prevalent 23.80% (19) in the age range of 21-30 years that was ranged from 10 equal or greater than 61 years. In another study, the average age of CSCI participants were 46 years that ranging from 17 to 76 (Morpeth and Williams, 2009).

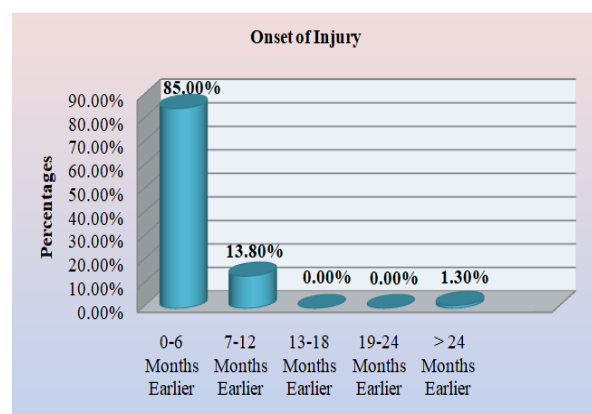
**Table 1. Demographic Information of the Participants**

Variables	Frequency (N=80)	Percentage (%)
<b>Gender</b>		
Male	71	88.8%
Female	09	11.3%
<b>Age</b>		

10-20 Years	10	12.50%
21-30 Years	19	23.80%
31-40 Years	23	28.70%
41-50 Years	13	16.30%
≥ 61 Years	07	8.80%
<b>Current Educational status</b>		
Illiterate	31	38.8%
Primary Level	14	17.5%
Under SSC	15	18.8%
SSC	09	11.3%
HSC	05	06.3%
Graduation	04	05%
Post-Graduation	2	2.5%
<b>Occupational Status</b>		
Student	08	10%
Housewife	07	8.8%
Farmer & Daily labour	23	28.7%
Businessmen	16	20%
Service Holder (Govt. and Private)	16	20%
Retire	01	1.3%
Others	09	11.35%

The study by Levi and Holtz (2006) & Wyndaele (2006) cited in Johansson and Kerstin (2013) estimated that CSCI affects young to middle-aged person with social and occupational responsibilities. So CSCI incidence was found higher among younger to middle age people.

Education is an important issue for socio-demographic characteristics. From 80 respondents a major group of respondents 38.8% (31) were founded to be illiterate and the remaining 18.8% (15) were in under SSC. So the incidence of CSCI is higher among those who are less educated.



**Figure 1. Onset of Injury of the Participants**

In this study among the total participants, the maximum number of respondents 28.7% (23) found was a farmer and daily labor. The percentage of service holders (government and private jobs) and businessmen both were 20% (16). According to Bickenbach et al. (2012), there are three main causes of traumatic spinal cord injury in Bangladesh including road traffic crashes, falls, and violence. So it is assumed that farmers, daily labor, businessman, and service holders are the most vulnerable for CSCI because in these occupations people have to go outside and carry heavy loads to maximum height rather than other occupations.

Amongst total participants, the highest number of the participants 85% (68) had injury 0-6 months earlier. MacBean, Ward, Murdoch, Cahill and Geraghty (2013) interpreted in their study that throughout the acute and sub-acute period of post-injury, phonation can be impaired by both complete and incomplete CSCI, with type and severity of impairment/s. So it is inferred that most of the participants with CSCI had injury 0-6 months earlier.

### Impact on the Voice (Voice Handicap Index-10 Questionnaires)

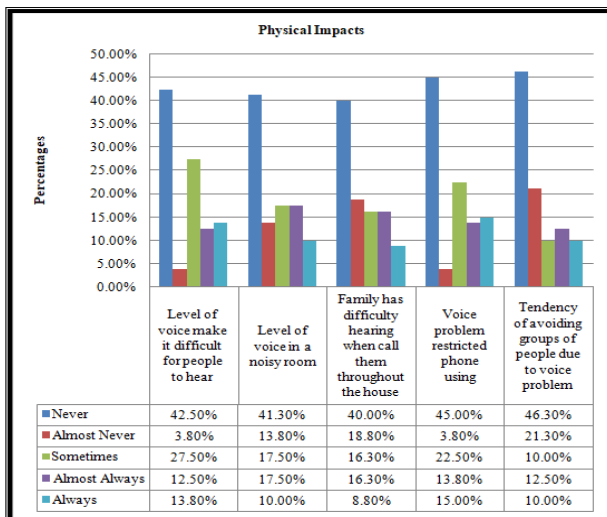


Figure 2. Physical Impacts of the Participants

Results from this study, under physical impacts, suggested that participants with CSCI experience a range of common problems. Most of the participants (17.5%) said that sometimes their voice made it difficult for people to hear whereas the majority of them said that people never had difficulty in hearing them. Many of the participants (17.5%) answered both that they had sometimes and almost always voice difficulty in a noisy room or place. 22.50% of participants were sometimes restricted from the phone using due to voice problems. 12.50% of participants responded that they almost always had a tendency of avoiding groups of people but the majority of the participants didn't have any tendency of avoiding groups of people due to voice problems. MacBean et al. (2006) interpreted in their study that the CSCI participants showed physical impairments of the respiratory and laryngeal systems that were consequential in perceived deviations in prosody and phonation during connected speech. So it can be indicated that nearly half of the person have physical impacts on their voice after CSCI.

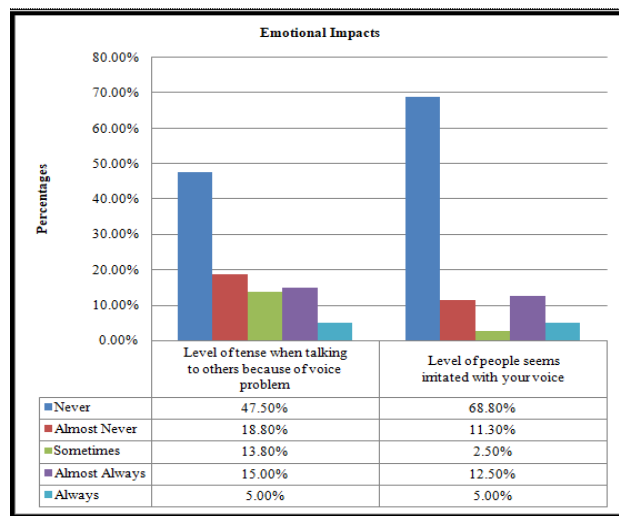
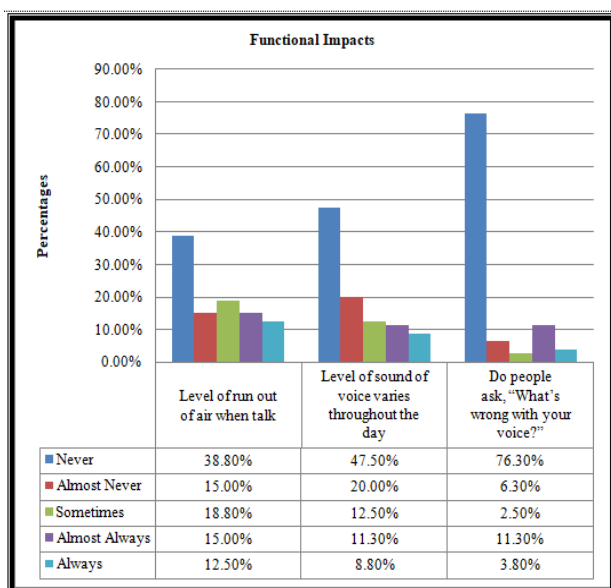


Figure 3. Emotional Impacts of Participants

The study result demonstrated that in the case of emotional impacts, most of the participants were

almost always tensed when talking with others whereas a small number (5.00%) of participants were always tensed when talking with others because of voice problems. The majority of the participants (68.80%) said that people never seem irritated with their voice but a few participants said that almost always people seem irritated with their voice. Johansson and Kerstin (2013) revealed that a major part of CSCI has a risk of voice fatigue that creates restrictions on communicative participation which affect social interactions with others. Thus, it is understood that few persons have emotional impacts on voice after CSCI.

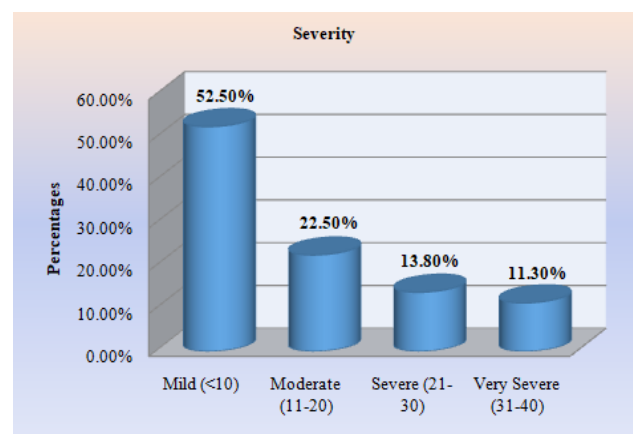


**Figure 4. Functional Impacts of the Participants**

In the functional impacts scale, 18.80% sometimes had run out of air during talking. Some of the participants sometimes experienced varied voices throughout the day. The majority of the participants (76.30%) explained that never people asked them "What's wrong with your voice" but few of the participants said that almost always people asked them "What's wrong with your voice". Johansson and Kerstin (2013) found in their study that the total score and the scores of the Sw-VHI for the two subscales like "Functional" and "Physical" impacts were

significantly higher in the group with CSCI than in the control group with the non-injured group. So it can be indicated that less than half of person have functional impacts on voice after CSCI.

The severity of impairments and the impact on quality of life differed between the cases (MacBean et al., 2013). In the study with a total (of 80) participants few of the participants (11.30%) faced voice problems at a very severe level (VHI=31-40), and some of the participants (13.80%) faced severe level (VHI=21-30) voice problems. It was found that the maximum participants 22.5% (18) rated as having a moderate problem (VHI=11-20). But a majority number 52.5% (42) of participants rated at mild level (VHI>10).



**Figure 5. Severity of the Participants**

So it can be concluded that nearly half of the participants have voice difficulties after CSCI. In addition, Morpeth and Williams (2009) stated in their research that after getting voice therapy at least 80% of vocal fold paralyzes after ACDVF was recovered within 12 months. The authors also recommended regular follow-up and speech therapy for symptomatic patients. It can be summarized that CSCI patients require SLT services which will aim at improving the voice of these populations (CSCI).

## Conclusion

Patients with cervical spinal cord injury face several clinical problems in our country, whereas nearly most of them experience mild to moderate voice deficits secondary to poor respiratory support. It's also a life-threatening issue that has negative functional, physical, and emotional impacts on communication. In Bangladesh, Speech & Language Therapy services for SCI patients are newly introduced in the last few years. So for providing proper comprehensive services to SCI patients the monitoring of communicative function from the acute phase to the community reintegration phase is essential.

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## Conflict of interests

No potential conflict of interest relevant to this article was reported.

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