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Original Research Article

Impact of COVID-19 on socio-behavioural, health and oral health-related aspects on spinal cord injury patients: a cross-sectional study

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ABSTRACT

Background: Spinal cord injury (SCI) is a damaging, life-altering injury, which is estimated to have an annual global incidence of 40 to 80 cases per million population and is two to five times more possible to die prematurely. This study aims to evaluate the impact of COVID-19 on socio-behavioural, health, and oral health-related aspects of spinal cord injury patients.
Methods: This cross-sectional study was conducted among 50 spinal cord injury patients in the rehabilitation center in Chennai, Tamil Nadu, which was conducted between May and June 2022.
Results: The comparison of mean distribution scores based on DMFT showed that complete injury patients had a lower DMFT score of 6.40 when compared to incomplete injury (8.41). The periodontal status assessment revealed that SCI with complete injury had a lower mean number of teeth with gingival bleeding and periodontal pocket (3.81 and 2.31 respectively) when compared to incomplete injury (7.12 and 4.49). Moreover, the impact of COVID-19 on the socio-behavior and health status was found to be higher in complete injury than that in incomplete injury patients.
Conclusions: Therefore, this pandemic highlights the need to advocate the development of a nationwide SCI registry or surveillance system is fundamental to an understanding of the epidemiology and, hence, the prevention of this emerging health burden.

Keywords: COVID-19, Health, Oral health, Socio-behaviour, Spinal cord injury

INTRODUCTION

Spinal cord injury (SCI) is a damaging, life-altering injury, which challenges clinicians to treat under ideal circumstances.[1] People with spinal cord injury are estimated to have an annual global incidence of 40 to 80 cases per million population and are two to five times more possible to die prematurely.[2]

The most common causes of SCI in the world are traffic accidents, gunshot injuries, knife injuries, falls, and sports injuries. The injury usually caused by flexion, compression, hyperextension, or flexion-rotation mechanisms is called "primary damage''. The responses of the body to overcome the primary damage, such as hemorrhage, inflammation, etc, are described as secondary damage.[3]

Individuals with SCI are highly susceptible to infections, which increases the risk in the absence of quality health and personal care.[4] A complete injury means full loss of motor and sensory functions at the distal level of injury. Incomplete injury defines partial preserving of some sensory and motor functions below the affected area sparing the deep or anal mucocutaneous superficial sense.[5] The COVID-19 pandemic, which originated in Wuhan city, China has rapidly spread to various countries, with many cases being reported worldwide. The Ministry of Health and Family Welfare of India has

upstretched awareness of the recent outbreak and has taken necessary actions to prevent the further spread of COVID-19.[6] Due to its potential health hazards, the World Health Organization declared COVID-19 a pandemic on 11 March 2020.[7]

As the world progresses through the different phases of the COVID-19 pandemic, it has brought about significant changes both in the socio-behavioral and health aspects of spinal cord injury patients.

Many countries declared strict quarantine and preventive regulations including home confinement, maintaining social isolation, wearing face masks, telecommunication, prohibition of gatherings, etc to contain the virus as much as possible.[8]

SCI is often associated with the need for caregiver support, the regular use of equipment, and vulnerability to pulmonary infection, this subset of individuals requires special planning, attention, and consideration.[9] With the increasing number of COVID-19 cases, and considering the population of persons with spinal injuries, there is a need to increase health education at the community level regarding personal hygiene.[10] Recurrent outbreaks of COVID-19 are expected, and as the reality of our "new normal" sets in, the collective experience of spinal cord colleagues from around the world will assist in informing and guiding care and management strategies.[11]

Moreover, SCI patients experience a combination of dry mouth from xerostomia-causing medications, barriers to dental care access due to upper-limb weakness, poor hand function to perform oral hygiene, impaired manual dexterity, dependence on caregivers for oral hygiene, etc which may adversely affect their oral health, thereby significantly increasing the risk of oral health problems, such as dental caries and periodontal disease.[12]

Therefore this study aims to evaluate the impact of COVID-19 on socio-behavioural, health, and oral health-related aspects of spinal cord injury patients.

METHODS

This cross-sectional study was conducted among 50 spinal cord injury patients in the rehabilitation center in Chennai, Tamil Nadu. The study was conducted between May and June 2022.

This study was commenced only after obtaining Ethical clearance from the Institutional Review Board of Ragas Dental College and Hospital.

Inclusion criteria

The participants with various levels of spinal cord injury and undergoing treatment for the past 2 years, and participants who have consented to participate were included in the study.

Exclusion criteria

Participants other than spinal cord injury, and participants who are not willing to voluntarily participate in the study will be excluded.

The participants were provided with a self-administered closed-ended questionnaire comprised of 33 questions of which 24 questions assessed the impact of COVID-19 on socio-behavioural and 9 questions assessed the impact of COVID-19 on health aspects of spinal cord injury patients. The same examiner evaluated the impact of the oral health status of the participants using the World Health Organization (WHO) Oral Health Recording Pro forma, 2013. All participants were educated about the study and were made to sign a free and clarified consent form. Background information, including the age of the participant, gender, marital status, time since injury, socioeconomic status, type of injury, and educational status, were included in the questionnaire. The participant's confidentiality and privacy were secured. All participants were requested to answer all the questions by selecting the appropriate response which was distributed to them through google forms. The participants took approximately about 10-12 minutes to complete the online form. After completion, the online google forms were submitted to evaluate the impact of COVID-19 on socio-behavioral, health, and oral health-related aspects of spinal cord injury patients.

Sample size calculation

The sample size was calculated using G*Power software (version 3.1) based on the data results from a study conducted by Karthikayan et al (2018). The software was given the following inputs: The alpha error was set at 5% (0.05), power was set at 80% (0.08), and the effect size was set at 0.43. A final sample of 50 spinal cord injury patients in the rehabilitation center participated in the study.

Statistical analysis

The collected data were entered into Microsoft Excel 2019, and statistics were analyzed using the Statistical Package for the Social Science (SPSS) version 20.0. Descriptive statistics were performed, and the comparison of mean distribution is performed between types of spinal cord injury patients based on Sociobehaviour, Health, and Oral Health (DMFT, Periodontal assessment) along with the frequency distribution of loss of attachment scores.

RESULTS

Of the total 50 spinal injury patients, 39 were classified as incomplete level of spinal injury and 11 had a complete level of spinal injury. Among the 50 participants, 48(96%) were male and 2(4%) were female with 64% of them above 30 years. 70% of the participants were married. Of the total participants, the majority (26%)

belonged to the upper-lower socioeconomic class (Table 1).

Table 1: Demographic characteristics among the spinal cord injury patients.

Demographic characters	N (%)
Gender	
Male	48 (96)
Female	2 (4)
Marital status	
Married	35 (70)
Unmarried	15 (30)
Age (years)	
≤30	18 (36)
>30	32 (64)
Minimum age	23
Maximum age	67
Socioeconomic status*[21]	
Upper	10 (20)
Upper middle	8 (16)
Lower middle	10 (20)
Upper lower	13 (26)
Lower	9 (18)

*Modified Kuppuswamy socioeconomic scale updated for the year 2020

Assessment of oral health

The comparison of mean distribution scores based on DMFT showed that complete injury had a lower DMFT score of 6.40 compared to incomplete injury (8.41). Assessment of the periodontal status revealed a lower mean number of teeth with gingival bleeding and periodontal pocket (3.81 and 2.31 respectively) among complete injury than that of incomplete injury (7.12 and 4.49). The majority of the participants had a score of 2 in attachment loss i.e., 53.8% in incomplete and 54.6% in a complete level of injury (Table 2).

Table 2: Comparison of mean distribution between types of spinal cord injury patients based on decayed, missing, filled teeth and periodontal status along with the frequency distribution of loss of attachment scores.

	Mean±SD	
	Complete injury (n=11)	**Incomplete injury (n=39)**
DMFT	6.40±3.22	8.41±2.22
Gingival bleeding	3.81±2.42	7.12±3.81
Periodontal pocket	2.31±1.51	4.49±2.67
Loss of attachment (%)		
Score 0	2 (18.1)	6 (15.4)
Score 1	3 (27.3)	12 (30.8)
Score 2	6 (54.6)	21 (53.8)

Impact of COVID-19 on the socio-behavior and health-related aspects of spinal injury patients

The comparison of mean distribution scores between the type of injury based on the impact of COVID-19 on the socio-behavior showed that complete injury had higher fear and anxiety (3.91), household confinement (3.63), lifestyle modifications (4.21), preventive measures (3.25), and coping strategies (3.09) when compared to incomplete injury (2.56, 2.97, 2.52, 2.72 and 2.92 respectively). Furthermore, the mean scores of the Impact of COVID -19 on health status were also found to be higher in complete injury (4.72) than those patients with incomplete injury (2.94) as summarized in Table 3. Higher the scores (fear and anxiety, household confinement, lifestyle modifications, preventive measures, and health aspect), the greater the negative impact of COVID-19 on spinal injured patients. The higher the score in coping strategies, the greater the one indulging in coping strategies to overcome the negativity due to COVID-19.

Table 3: Comparison of mean distribution scores between types of spinal cord injury patients based on the impact of COVID-19 on socio-behavior and health status.

Questions	Complete injury	Incomplete injury
Impact of COVID -19 on sociobehaviour		
Fear and anxiety	3.91±1.30	2.56±1.15
Household confinement	3.63±1.28	2.97±1.12
Lifestyle modifications	4.41±1.25	2.52±1.44
Preventive measures	3.25±1.34	2.72±1.33
Coping strategies	3.09±1.74	2.92±1.15
Impact of COVID-19 on health status	4.72±1.23	2.94±1.56

DISCUSSION

A complete injury means full loss of motor and sensory functions at the distal level of injury.[4] While incomplete injury defines partial preserving of some sensory and motor functions below the affected area sparing the deep or anal mucocutaneous superficial sense.[5] The COVID-19 pandemic poses a major challenge to the health system, especially for individuals with SCI, as they are often immunocompromised and may be at increased risk of health deterioration.[6] As a rapidly growing number of COVID-19 patients were utilizing hospital and medical resources for primary, secondary, and tertiary prevention, there was postponement and inaccessibility to medical services to those affected with spinal cord injured individuals.[7] Apart from health issues, adults with SCI also face numerous obstacles in regular dental care services, including high cost, dental fear and anxiety, physical barriers (wheelchair-inaccessible dental offices), limited transportation, lack of dentists specializing in oral health needs of this population, and limited knowledge of

oral health issues.[8] Therefore this study yields a wealth of insights into how the COVID-19 pandemic has impacted SCI patients on the socio-behavioural, health, and oral health practices.

The limitation of people circulating outside their homes, social distancing, the cessation of almost all working activities, and the use of protective masks and gloves all have the aim of minimizing the likelihood that people who are not infected come into contact with others who are already infected and probably still asymptomatic.[9] In the present study, the impact of COVID-19 on both socio-behaviour and health aspects was found to be higher in complete spinal cord injured than those with incomplete spinal cord injured persons. LaVela et al highlighted the magnitude of consequences faced by individuals with SCI when restrictions to health care, healthy lifestyle endeavors, and social participation occurred during the COVID-19 pandemic which is in accordance with the current study.[15]

Hearn et al suggested that the deterioration in physical health is due to difficulty in accessing health services, especially physical therapy rehabilitation centers, in addition to an increased probability of infection which remains the most common reason for mortality following SCI.[16] Abdelrahman et al have stated that individuals with SCI during the COVID-19 pandemic experienced a variety of personal, physical, psychological, and social challenges, each of which could negatively affect daily functioning and quality of life which coincides with the present study as complete spinal cord injury had a greater impact of covid on health and socio-behaviour domain.[17]

Among the major barriers that limit dental access among persons with SCI, physical barriers may be the factor mostly under the control of dental health professionals.[13] It is very much essential for caregivers to play a pivotal role in improving oral health by brushing their teeth and flossing their teeth every day, making them visit a dentist regularly, rinsing their dentures after every meal, etc.[14] The incomplete spinal cord injured persons were found to have higher DMFT, gingival bleeding, and periodontal pocket with a majority of them having a score of 2 in attachment loss (53.8%) compared to complete spinal injured persons. Pakpour et al stated that SCI patients had poor oral hygiene practices, greater levels of plaque, gingival bleeding, and caries experience which is similar to that of the current study.[18] On the contrary, Khattar et al stated that the level of oral health in SCI patients was fair with 1.7% of edentulousness and 8.2% need for restorative treatment and extractions.[19] Yuen et al stated that the medications usually prescribed in these patients to treat muscle spasms and neurogenic bladder disorders might lead to xerostomia which in turn leads to increased accumulation of dental plaque and also dental caries.[20]

The study done by Yuen et al on oral health survey findings revealed that individuals with SCIs have a lower likelihood of visiting dentists to attain dental cleaning services than others. A multivariate analysis of the reasons behind this low prevalence of dental clinic visits revealed that the individuals with SCI reported physical barriers to accessing dental clinics and feared the visits themselves. He also reported that the cost of dental care could be a contributing factor behind the limited access to dental services among individuals with SCI.[20]

This study has some limitations. The study only recruited and contacted individuals with SCI who use social media, limiting the ability to reach other individuals who do not use social media. Moreover, the sample size is small and the convenience sampling method hinders the generalizability of the results of the current study.

CONCLUSION

As the world is going through the process of "Covidisation", significant changes were observed in, social-behavioral, health, and oral health, especially of spinal cord injured persons. Oral health appears to be compromised in people with SCI, which suggests the need to focus more attention on the provision of adequate dental and periodontal care to this population. Low-cost preventive and dental treatment service for people with SCI remains an important unmet need. Education for patients, relatives, and the staff on oral healthcare issues should be encouraged, and facilitated. Therefore, this pandemic highlights the need to advocate the development of a nationwide SCI registry or surveillance system is fundamental to an understanding of the epidemiology and, hence, the prevention of this emerging health burden.

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Supplementary File

Questions on the impact of COVID-19 pandemic on socio-behavioural status of spinal cord injured persons

Category A: Fear and anxiety

1. How much has the fear of getting infected with COVID-19 affected your life?
a. Not at all/Not applicable
b. A little
c. Somewhat
d. Considerably
e. Extremely
2. How much do you avoid reading or listening COVID-19 related news and messages?
a. Not at all/Not applicable
b. A little
c. Somewhat
d. Considerably
e. Extremely
3. How much confusion do you feel about current information available about COVID-19 from different media sources?
a. Not at all/Not applicable
b. A little
c. Somewhat
d. Considerably
e. Extremely

Category B: Household confinement

4. How much have you experienced home confinement due to COVID-19?
a. Not at all/Not applicable
b. A little
c. Somewhat
d. Considerably
e. Extremely
5. How much has the household confinement during COVID-19 affected your life?
a. Not at all/Not applicable
b. A little
c. Somewhat
d. Considerably
e. Extremely
6. How much has the feeling of getting socially cut off during COVID-19 affected your life?
a. Not at all/Not applicable
b. A little
c. Somewhat
d. Considerably
e. Extremely
7. How have the disruptions in day to day social interactions with family and/or friends due to COVID-19 affected your life?
a. Not at all/Not applicable
b. A little
c. Somewhat
d. Considerably
e. Extremely
8. How much impact does COVID 19 have on your religious and spiritual ceremonies?
a. Not at all/Not applicable
b. A little
c. Somewhat
d. Considerably
e. Extremely

Category C: Lifestyle Modifications

9. During COVID-19 pandemic, how has the intake of homemade juices/other foods that you believe might increase your immunity has changed as compared to pre-COVID-19 period?
a. Significantly decreased
b. Slightly decreased

c. Grossly similar
d. Slightly increased
e. Significantly increased

10. During COVID-19 pandemic, how has your intake of fried and junk foods changed as compared to pre-COVID-19 period?

a. Significantly decreased
b. Slightly decreased
c. Grossly similar
d. Slightly increased
e. Significantly increased

11. During COVID-19 pandemic, how has the probability of exercising regularly changed as compared to pre-COVID-19 period?

a. Significantly decreased
b. Slightly decreased
c. Grossly similar
d. Slightly increased
e. Significantly increased

12. During COVID-19 pandemic, how has your quality of sleep changed as compared to pre-COVID-19 period?

a. Significantly worse quality
b. Slightly worse quality
c. Grossly similar
d. Slightly better quality
e. Significantly better quality

13. During COVID-19 pandemic, how has the probability of sleeping for 7-8 hours daily changed as compared to pre-COVID-19 period?

a. Significantly decreased
b. Slightly decreased
c. Grossly similar
d. Slightly increased
e. Significantly increased

Category D: Preventive practices:

14. How frequently do you wear masks while stepping out of the house?

a. Rarely/Never
b. Sometimes
c. Commonly
d. Mostly
e. Always

15. How frequently do you cover your mouth and nose by mask or clothes properly?

a. Rarely/Never
b. Sometimes
c. Commonly
d. Mostly
e. Always

16. How frequently do you maintain social distance of at least 1 metre distance with other people?

a. Rarely/Never
b. Sometimes
c. Commonly
d. Mostly
e. Always

17. How frequently do you ensure frequent hand washing/sanitizing?

a. Rarely/Never
b. Sometimes
c. Commonly
d. Mostly
e. Always

18. While washing your hands how frequently do you ensure washing hands for at least 20 seconds?

a. Rarely/Never
b. Sometimes
c. Commonly
d. Mostly

e. Always

19. How frequently do you ensure cleaning your groceries thoroughly before consuming during COVID-19?
a. Rarely/Never
b. Sometimes
c. Commonly
d. Mostly
e. Always

Category E: Coping strategies:

20. How much do you make efforts to avoid the thoughts of COVID-19?
a. Not at all/Not applicable
b. A little
c. Somewhat
d. Considerably
e. Extremely
21. What all efforts do you make to avoid thoughts of COVID-19? (More than one option can be marked)
a. Do not make any efforts
b. Try to divert attention by watching TV/Videos
c. Try to divert attention by conversing with people
d. Try to divert attention by doing pooja/prayers
e. Try to divert attention by doing exercise
f. Others.

Questions on the impact of COVID-19 pandemic on the health status of spinal cord injured persons

1. Have you experienced any difficulty in visiting your doctor for medical appointments due to COVID-19?
   a) Never b) Almost never c) Occasionally d) Fairly often e) Very often
2. Have you experienced any difficulty in communication with the medical personnel?
   a) Never b) Almost never c) Occasionally d) Fairly often e) Very often
3. Have you come across a decrease in the availability of therapy?
   a) Never b) Almost never c) Occasionally d) Fairly often e) Very often
4. Have you faced any difficulty in transportation at the time of Covid-19?
   a) Never b) Almost never c) Occasionally d) Fairly often e) Very often
5. Have you felt any shortage in the availability of caregivers?
   a) Never b) Almost never c) Occasionally d) Fairly often e) Very often
6. Is there any decrease in the availability of supplies (specific to SCI care)?
   a) Never b) Almost never c) Occasionally d) Fairly often e) Very often
7. Have you experienced any decrease in the availability of medications?
   a) Never b) Almost never c) Occasionally d) Fairly often e) Very often
8. Have you experienced any lack of technology in receiving telehealth care?
   a) Never b) Almost never c) Occasionally d) Fairly often e) Very often
9. Have you experienced any change in lifestyle after Covid-19?
   a) Never b) Almost never c) Occasionally d) Fairly often e) Very often

Scoring scheme

Socio-behavioural aspect

Category A: Fear and anxiety

Scoring: Not at all/Not applicable = 1, A little = 2, Somewhat = 3, Considerably = 4, Extremely = 5 (The higher the score, the greater the fear and anxiety due to COVID-19)

Category B: Household confinement

Scoring: Not at all/Not applicable = 1, A little = 2, Somewhat = 3, Considerably = 4, Extremely = 5
Rarely/Never = 1, Sometimes = 2, Occasionally = 3, Frequently = 4, Almost daily = 5
(The higher the score, the greater is the adverse effect of household confinement due to COVID-19)

Category C: Lifestyle Modifications

Scoring: Significantly decreased = 1, Slightly decreased = 2, Grossly similar = 3, Slightly increased = 4, Significantly increased = 5
(The higher the score, the greater is the positive impact of COVID-19 on healthy lifestyle of people)
(The higher the score, the greater is the negative impact of COVID-19 on healthy lifestyle of people)

Category D: Preventive practices:

Scoring: Rarely/Never = 1, Sometimes = 2, Commonly = 3, Mostly = 4, Always = 5

(The higher the score, the greater is the one affected by COVID-19 and is thus, following preventive practices against COVID-19)

Category E: Coping strategies:

Scoring: Not at all = 1, A little = 2, Somewhat = 3, Considerably = 4, Extremely = 5

(The higher the score, the greater is the one indulging in coping strategies to overcome the negativity due to COVID-19)

Health aspect

Scoring: Never = 1, Almost never = 2, Occasionally = 3, Fairly often = 4, Very often = 5

(The higher the score, the greater is the one's health affected by COVID-19).