

ORIGINAL ARTICLE

Epidemiology of spinal column injuries before, during, and after the COVID-19 pandemic – is there any difference?

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Summary

Introduction: The lack of information in international literature regarding the impact of the introduction and the subsequent termination of epidemiological restrictions during the COVID-19 pandemic on the epidemiology of spinal injuries has led to the constant monitoring and recording of all relevant data on patients with spinal column injuries since the beginning of the pandemic.

Study Aim: To analyze and compare epidemiological data on patients with spinal column injuries treated at a tertiary healthcare facility in Serbia, before, during, and after the COVID-19 pandemic.

Materials and methods: This is a retrospective study spanning three observation periods analyzing patients with spinal column injuries.

Results: The average age of patients in the first observation period was 47 years, 68 years in the second, and 39 years in the third period. In the first two observation periods, the dominant mechanism of injury was same-level fall, and most of the patients were treated conservatively. When comparing the data on the three groups of respondents, statistically significant differences in the age of the patients and the mechanism of injury can be observed.

Conclusion: The COVID-19 pandemic contributed to spinal column injuries being more common among the elderly, due to falls occurring at home. However, after people returned to an active lifestyle, which was especially true of the younger population, there was a sudden increase in the number of spinal column injuries due to road traffic accidents, while due to the frequent occurrence of spinal cord injuries, there was also an increase in the number of emergency surgeries.

Keywords: COVID-19, spinal column injuries, mechanism of injury, surgical treatment



INTRODUCTION

The COVID-19 pandemic and the resulting epidemiological restrictions limiting free movement, prohibiting large gatherings, and restricting the working hours of most establishments in the entertainment, hospitality, and services industries, brought about certain changes, both in everyday life and in the functioning of the healthcare system (1-3). The overburdening of the healthcare system with COVID patients on the one hand, and the reduced movement and activity of people on the other hand, led to certain changes in the epidemiology of spinal column injuries and other bone-joint injuries, as compared to the period before the pandemic (4-8). After the pandemic restrictions were lifted, people resumed an active lifestyle. The health system gradually recovered and began to operate at its full capacity, i.e., like before the pandemic.

Generally, in the epidemiology of spinal column injuries, most studies have shown the ratio of male to female injuries to be 2:1 (9). The most common mechanisms of injury are road traffic trauma in the younger population and falls in the older population (9-11). What makes spinal column injuries both unique and complex is the injury to the spinal cord. The mechanism of injury to the spinal column, i.e. the type of injury, as well as the degree of injury, play a major role in spinal cord damage, and thus in the degree of neurological deficit (12). The prognosis for recovery is uncertain, and the estimate is that people above the age of 60 years with a spinal cord injury have a poorer prognosis for recovery and experience a lower quality of life after the injury (9). Medicamentous therapy with methylprednisolone and early surgical stabilization within the first 24 hours after injury play a role in the degree of recovery after injury to the spinal column and spinal cord (13-16).

The study aims to compare the epidemiological data on spinal column injuries from the period before, during, and after the COVID-19 pandemic, and to determine whether there were differences in the number of spinal column injuries, the demographic characteristics of patients, the mechanisms of injury, and the treatment modalities, in the context of the introduction and then the termination of epidemiological restrictions. The hypothesis is that, during the COVID-19 pandemic, there was a lower rate of patients with spinal column injuries, as compared to the time before and after the pandemic.

MATERIALS AND METHODS

This is an observational, descriptive, retrospective, single-center study. Epidemiological data on patients with spinal column injuries treated at the trauma center of a tertiary healthcare facility in Serbia were collected for three different observation periods. A total of 368 patients with spinal column injuries were recorded in the

first observation period, i.e., in the 18 months preceding the COVID-19 pandemic. In the second observation period, i.e. over the duration of the COVID-19 pandemic, 363 patients with spinal column injuries were recorded. Finally, in the third observation period, lasting 18 months after the COVID-19 pandemic, 326 patients with spinal column injuries were recorded. Sex, age, the mechanism of injury, the type of injury, neurological deficit, and the treatment modality were recorded in all patients. The data were obtained from the hospital admission protocol of the University Clinical Center of Serbia Emergency Center, the treatment protocol of the Department of Spinal Surgery of the University Clinical Center of Serbia Emergency Center, and the surgery treatment protocol of the said department. In all patients, the appropriate diagnostic procedures were performed (conventional radiography – X-rays; computed tomography – CT), their neurological status was assessed (the ASIA score – American Spinal Injury Association Impairment Scale was applied; according to ASIA score neurological findings can be without neurological impairment – ASIA E, complete neurological impairment (paraplegia or quadriplegia) – ASIA A, or with preserved sensibility and loss of motor skills in varying degrees – ASIA B, C, D), as was their general health status, upon which a decision was made whether to treat the patient conservatively or surgically.

The findings were processed using methods of descriptive statistics, one-way ANOVA, Student's t-test, Chi-square test and the statistical significance was set at $p < 0.05$. The EZR software was used for statistical data processing.

RESULTS

The values regarding age, gender distribution, mechanism of injury, injury level and treatment modality are presented in Table 1. All conservatively treated patients in all three periods had normal neurological findings – ASIA E (Appendix I, Table 2). During the first observation period two patients died, of whom one patient with a cervical spine injury and quadriplegia, and one patient with a thoracic spine injury and paraplegia. During the second observation period four patients died, of whom three patients with a cervical spine injury and quadriplegia, and one patient with a thoracic spine injury and paraplegia. During the third observation period six patients died, of whom four patients with a cervical spine injury and quadriplegia, and two patients with a thoracic spine injury and paraplegia.

DISCUSSION

The results of this epidemiological study showed that there was an approximately equivalent number of patients with spinal column injury during all three observation

Table 1. Descriptive parameters of spinal column injuries before, during, and after the COVID-19 pandemic

	Before the COVID-19 pandemic (n=368, 100%)	During the COVID-19 pandemic (n=363, 100%)	After the COVID-19 pandemic (n=326, 100%)
Age (years) [median (min-max)]	47 (14-92)	68 (15-92)	39 (14-77)
Male / Female	219 / 149 (59.5% / 40.5%)	228 / 135 (62.8% / 37.1%)	198 / 128 (60.7% / 39.3%)
Mechanism of injury			
Same-level fall	204 (55.4%)	211 (58.1%)	94 (28.8%)
Road traffic accident	111 (30.2%)	97 (26.7%)	154 (47.3%)
Fall from height above two meters	53 (14.4%)	55 (15.2%)	78 (23.9%)
Injury level			
Thoracic and lumbar spine	249 (67.7%)	305 (84.1%)	193 (59.2%)
Cervical spine	119 (32.3%)	58 (15.9%)	133 (40.8%)
Treatment modality			
Conservative	257 (69.8%)	206 (56.7%)	176 (54%)
Surgical	111 (30.2%)	157 (43.3%)	150 (46%)

periods. Men were dominantly injured in all three periods. Regarding age, the younger population was dominant in the period after COVID-19 pandemic, while older population was dominant in the periods before and during the pandemic. In the periods before and during the pandemic, same-level falls were the most common mechanism of injury, while in the period after the pandemic, road traffic trauma was the dominant mechanism of injury. In the first two observation periods, the most frequently injured segment of the spinal column was the thoracolumbar spine, while in the third observation period, an approximately equivalent number of patients with thoracolumbar and cervical spine injuries was recorded. In the periods before and during the pandemic, most patients were treated conservatively, while after the pandemic a similar number of patients were treated conservatively and surgically ([Appendix I, Table 1](#)).

Furthermore, here was recorded that in the period after the COVID-19 pandemic, the drivers who caused road traffic accidents were often inebriated. Also, in our study, an increased number of attempted suicides (*Lat. tentamen suicidi*) was recorded among the younger population, as compared to the period before and during the pandemic.

This study has shown that in a tertiary health institution in Serbia, there was no significant difference in the number of patients with spinal column injuries, the number

of surgical procedures, and the injury level, before, during, and after COVID-19 pandemic ($p > 0.05$). However, it was established that there was a significant difference in the age, as well as the mechanism of injury, before, during, and after COVID-19 pandemic ($p < 0.05$), ([Appendix I, Table 1](#)).

A comparison of the observation periods for variables where statistical significance was found had shown that, regarding patient age and mechanism of injury, there was a significant difference between the first and the third, as well as between the second and the third observation periods, while between the first and the second observation periods, a significant difference was not found ([Appendix II, Table 3](#)).

Studies performed during COVID-19 pandemic worldwide have proved that there was a significantly lower rate of patients with spinal cord injuries admitted to major trauma centers during the pandemic, as well as that a lower rate of both elective and emergency spinal surgeries was performed, as compared to the period before the pandemic (17-19). Restrictions on free movement during the pandemic could be considered as the factor inducing such a situation, as well as the large influx of patients suffering from the new disease. Iyengar K. et al. showed that Coronavirus outbreak had refocused orthopedic minds on managing many injuries (among them spinal column injuries) conservatively, which would have otherwise been managed with operative fixations (20).

Table 2. Neurological findings in the followed periods

	Before the COVID-19 pandemic (n=111, 100%)	During the COVID-19 pandemic (n=157, 100%)	After the COVID-19 pandemic (n=150, 100%)
Preoperative neurological finding			
Normal	68 (61.3%)	118 (75.2%)	82 (54.7%)
Paraplegia	33 (29.7%)	31 (19.7%)	45 (30%)
Quadriplegia	10 (9%)	8 (5.1%)	23 (15.3%)
Postoperative neurological finding in the patients with a neurologic deficit found before surgery			
Improved as compared to the initial finding	15 (34.9%)	17 (43.6%)	20 (29.4%)
Unchanged as compared to the initial finding	28 (65.1%)	22 (56.4%)	48 (40.6%)

Table 3. The comparison of data for all three observation periods, as well as the comparison between individual periods for variables where a statistically significant difference was found

	Comparing all three observation periods	Comparing the first and the second observation periods	Comparing the second and the third observation periods	Comparing the first and the third observation periods
Number of patients	p = 0.071	p = 0.065	p = 0.074	p = 0.074
Age	p < 0.001	p = 0.569	p < 0.001	p < 0.001
Sex	p = 0.788	p = 0.612	p = 0.743	p = 0.067
Mechanism of injury	p < 0.001	p = 0.718	p < 0.001	p < 0.001
Injury level	p = 0.06838	p = 0.083	p = 0.078	p = 0.061
Treatment modality	p = 0.07861	p = 0.062	p = 0.071	p = 0.079

The data obtained from other studies do not correlate with our study, and the reason for this may be that the Emergency Center of the University Clinical Center of Serbia was the only functioning trauma center during the COVID-19 pandemic, operating at its full capacity before, during, and after the COVID-19. More patients from the entire territory of Serbia than usual were cared for and treated here, while other health facilities throughout Serbia performed less spinal column injuries surgery than before, due to transforming capacities into COVID-19 centers with the primary goal of caring for patients suffering from the new COVID-19 infection.

The limitations of this study are that it included just one trauma center, as well as the fact that the trauma center was operating at its regular capacity even during the pandemic.

CONCLUSION

The COVID-19 pandemic and the resulting epidemiological restrictions contributed to spinal column injuries being more common among the elderly, due to falls occurring at home. Additionally, patients were generally without neurologic deficits and mostly treated conservatively. However, after the restrictions were lifted, people resumed their former lifestyle, using cars and public transportation more frequently, which led to a sudden increase in the number of spinal column injuries caused by road traffic accidents, especially among the younger population. The severity of trauma caused by such a mechanism of injury also led to an increase in the number of emergency surgeries, as compared to the period before and during the pandemic.

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EPIDEMIOLOGIJA POVREDA KIČMENOG STUBA PRE, ZA VREME I NAKON PANDEMIJE IZAZVANE KOVIDOM 19 – IMA LI RAZLIKE?

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Sažetak

Uvod: Nedostatak informacija u svetskoj literaturi o uticaju uvođenja, a potom i ukidanja epidemioloških mera na epidemiologiju povreda kičmenog stuba nave nas je na konstantno praćenje i beleženje svih relevantnih podataka o pacijentima sa povredama kičmenog stuba od početka pandemije.

Cilj rada: Sagledavanje i upoređivanje epidemioloških podataka u vezi sa povredama kičmenog stuba lečenih u tercijernoj zdravstvenoj ustanovi u Srbiji, pre, za vreme i nakon pandemije izazvane kovidom 19.

Materijal i metode: Retrospektivna studija koja obuhvata tri vremenska perioda praćenja pacijenata sa povredom kičmenog stuba.

Rezultati: Prosečne godine starosti pacijenata u prvom periodu praćenja su iznosile 47, u drugom 68, a u trećem

39 godina. U prva dva perioda praćenja dominantan mehanizam povređivanja je bio pad na ravnom, a pacijenti su najčešće lečeni konzervativno. Poređenjem podataka tri grupe ispitanika, uočavaju se statistički značajne razlike u godinama starosti pacijenata i mehanizmu povređivanja.

Zaključak: Pandemija izazvana kovidom 19 doprinela je većoj učestalosti povreda kičmenog stuba među starijim osobama, usled padova u kućnim uslovima. Međutim, nakon vraćanja aktivnom načinu života, posebno među mlađom populacijom, došlo je do naglog povećanja broja povreda kičmenog stuba usled saobraćajnog traumatizma, a zbog čestog postojanja povrede kičmene moždine, i do povećanja broja urgentnih operativnih zahvata.

Ključne reči: kovid19, povrede kičmenog stuba, mehanizam povređivanja, operativno lečenje

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