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The impact of COVID-19 on shoulder and elbow trauma in a skeletally immature population: an Italian survey

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Background: The aim of this study was to evaluate the impact of COVID-19 on the shoulder and elbow trauma in a skeletally immature population in 30 days starting from March 8, 2020, the first day of restrictions in Italy, and to compare it with the same period of 2019.

Materials and methods: All the skeletally immature (younger than 18 years) patients managed in the emergency unit of our hospital between March 8, 2020, and April 8, 2020 (COVID-19 [C19] period), for a shoulder and elbow trauma were retrospectively included and compared with patients with similar ages admitted in the same period of 2019 (no COVID-19 period). Six categories of diagnosis were distinguished: (1) contusions, (2) no physeal fractures, (3) physeal fractures (Salter-Harris), (4) sprains/subluxations, (5) dislocations, and (6) others (tendinitis, wounds, low back pain, and joint inflammation). According to the mechanism of injury, we arbitrarily distinguished 5 subgroups: (1) accidental fall; (2) sport trauma; (3) accident at school; (4) high-energy trauma occurred by car, public transport, and pedestrian investment; and (5) fall from height.

Results: During the C19 period, the number of total accesses in our trauma center steeply decreased: two-thirds less. Regardless of the patient age, we performed 65% less first aid shoulder/elbow services. The number of skeletally immature patients treated at our trauma center for all types of injuries was 350 during the no COVID-19 period and 54 during the C19 period; therefore, the influx of pediatric patients during the C19 period decreased by 84.6%. Furthermore, during the C19 period, (1) there were no cases of fractures, physeal fractures, and dislocations of the shoulder; (2) there were no cases of contusion, physeal fractures, and dislocations of the elbow; and (3) we observed the absence of high-energy, sports, and school injuries; and (4) during the pandemic, shoulder and elbow injuries mainly occurred as a result of accidental fall at home.

Conclusions: The pandemic forced us to become aware of the ways and places where skeletally immature subjects report shoulder and elbow traumas; therefore, it would be desirable that more considerable attention be directed toward the prevention of injury in areas at risk.

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On January 29, 2020, the Italian authorities declared the first cases of coronavirus in Italy: 2 Chinese tourists received hospitalization at the reference center for infectious diseases in Rome. Further, an Italian researcher from China with COVID-19 and a 17-year-old with flu-like symptoms but harmful for COVID-19, who stayed in Wuhan for a long time, were hospitalized at the same hospital the same day.

On January 30, the World Health Organization announced the global state of emergency, and on February 11, the name COVID-19 was given to the disease and SARS-CoV-2 to the virus.[16]

On February 21, in Italy, several nonimported cases of COVID-19 emerged in Lombardy (the most populated region of Italy). The affected cities' borders were closed so that nobody could leave or enter.

Suddenly, the COVID-19 infections continued to rise, and on March 4, the Italian Government closed schools, sports clubs, and

Institutional review board approval was not required for this retrospective study.

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public parks. All forms of social aggregation were forbidden. At that time, the positive cases of COVID-19 were approximately 3000.

On March 8, Lombardy, the most affected region, and 14 other provinces were isolated. The affected areas became "red zones." On the same day, the Italian prime minister announced that the restrictions imposed on Lombardy and the other 14 provinces were extended to the whole country. Hence, Italy became a "protected area." People were told not to leave their homes except for an essential and documented reason. Smart working was imposed; movement was strictly limited, and on March 22, the government forbade unnecessary travel between towns. Travel was only allowed for "urgent, verifiable work situations and emergencies or health reasons." People who tested positive for COVID-19 were strictly told not to leave their homes for any reason. At the same time, anyone with fever or respiratory symptoms was strongly encouraged to stay at home and limit social contact, including with the family doctor.

Finally, starting from March 28, all productive activities throughout the territory that were not considered strictly necessary, crucial, and indispensable were closed down, except for essential goods and services. All this information can be extracted from the Italian Civil Protection website.[15]

The restrictions mentioned above inevitably affected the orthopedic practices, in particular trauma centers. Although the impact of COVID-19 on adult trauma surgery has been partially elucidated, little is known regarding the pediatric population; therefore, we aimed to evaluate the effect of COVID-19 on the shoulder and elbow trauma in a juvenile population (skeletally immature) belonged to a highly populated suburban area, in 30 days starting from March 8, 2020, the first day of restrictions in Italy, and to compare it with the same period of 2019.

Materials and methods

All the skeletally immature (younger than 18 years) patients managed in the emergency unit of our hospital between March 8, 2020, and April 8, 2020 (COVID-19 [C19] period), for a shoulder and elbow trauma were retrospectively included and compared with patients with similar ages admitted in the same period of 2019 (no COVID-19 [NC19] period).

Clinical records of all participants were examined by 2 of the authors (R.P., V.C.) to obtain information regarding age, sex, mechanism of injury, and diagnosis.

Six categories of diagnosis were distinguished: (1) contusions, (2) no physeal fractures, (3) physeal fractures (Salter-Harris), (4) sprains/subluxations, (5) dislocations, and (6) others (tendinitis, wounds, low back pain, and joint inflammation).

According to the mechanism of injury, we arbitrarily distinguished 5 subgroups: (1) accidental fall; (2) sports trauma; (3) accident at school; (4) high-energy trauma occurred by car, public transport, and pedestrian investment; and (5) fall from height.

Statistical analysis

Continuous variables were expressed by the mean and standard deviation (SD) and were evaluated by the Student *t*-test or the Mann-Whitney *U* test. The categorical data were expressed as the number and percentage (%) and were evaluated by the χ^2 or Fisher exact test. The statistical test level was set as $P < .05$. SPSS23.0 was used to perform all the tests (IBM, Armonk, New York, USA).

Results

In the NC19 period, in our trauma center, there were 1699 cases; in the same month of the following year (C19 period), there were 528 accesses: two-thirds less. During the NC19 period, 160 patients turned to our trauma center for a shoulder and elbow trauma, whereas during the C19 period, 56 patients were treated for the same reasons. Therefore, we performed 65% less first aid shoulder/elbow services. The number of skeletally immature patients treated at our trauma center for all types of injuries was 350 (male: 193, female: 157; mean age [SD]: 12 [3.5]) during the NC19 period and 54 (male: 35, female: 19; mean age [SD]: 9.2 [4.5]) during the C19 period; therefore, the influx of pediatric patients during the C19 period decreased by 84.6%. Data relating to all contusions, no physeal fractures, physeal fractures, sprain/subluxations, dislocations, and others during the 2 periods are shown in Fig. 1. The decrease was 84.3% for contusions, 76.4% for no physeal fractures, 92.8% for physeal fractures, 92.0% for sprain/dislocation, 100% for dislocations, and 82.6% for others. Tables I–VI show the distribution of shoulder and elbow contusions, no physeal fractures, physeal fractures, sprains/subluxations, and dislocations in the 2 studied periods.

Figs. 2 and 3 show the different distribution of the trauma mechanisms in the 5 diagnostic groups.

Discussion

In Europe, our country was the first to adopt restrictive measures that prevented citizens from leaving home, except for proven health or working needs.

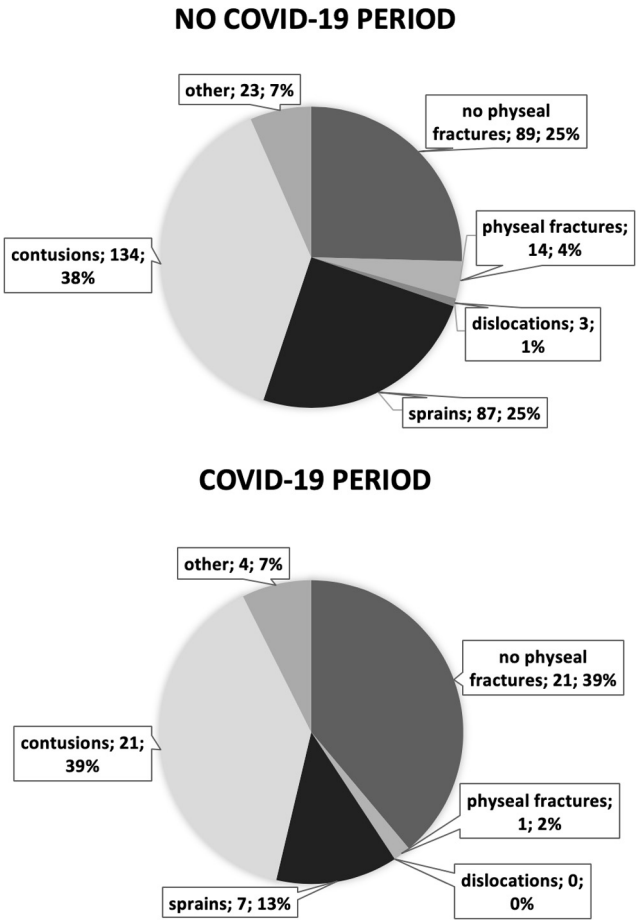

Figure 1 Distribution of injuries in the 2 different periods according to the 6 diagnoses. "Other" includes tendinitis, wounds, low back pain, and joint inflammation.

Table I
Mechanisms of injury responsible for shoulder and elbow contusions in the 2 examined periods

	Cases	M	F	Mean age (SD)	Accidental fall	Sport trauma	Accident at school	High energy	Fall from height
Shoulder contusions									
No COVID-19 period	8	5	3	15.6 (2.6)	2	0	1	5	0
COVID-19 period	1	1	0	9	1	0	0	0	0
Elbow contusions									
No COVID-19 period	6	4	2	10.5 (4.3)	3	1	1	1	0
COVID-19 period	3	3	0	5.7 (0.9)	3	0	0	0	0

SD, standard deviation.

Table II
Mechanisms of injury responsible for shoulder no physeal fractures in the no COVID-19 and COVID-19 periods

Three shoulder fractures (1 proximal humerus and 2 clavicle fractures)									
	Cases	M	F	Mean age (SD)	Accidental fall	Sport trauma	Accident at school	High energy	Fall from height
No COVID-19 period	3	2	1	13.3 (3.9)	0	1	1	1	0
COVID-19 period	0	0	0	–	0	0	0	0	0

SD, standard deviation.

Table III
Mechanisms of injury responsible for elbow no physeal fractures in the 2 studied periods

	Cases	M	F	Mean age (SD)	Accidental fall	Sport trauma	Accident at school	High energy	Fall from height
Elbow fractures									
No COVID-19 period	6	3	3	10.3 (4.1)	3	1	1	0	1
COVID-19 period	3	3	0	7.3 (6.3)	3	0	0	0	0
Distal humerus									
No COVID-19 period	1	0	1	6	1	0	0	0	0
COVID-19 period	2	2	0	3 (2)	2	0	0	0	0
Proximal ulna									
No COVID-19 period	2	1	1	9.5 (3.5)	0	0	1	0	1
COVID-19 period	0	0	0		0	0	0	0	0
Radial head									
No COVID-19 period	3	2	1	12.2 (3.3)	2	1	0	0	0
COVID-19 period	1	0	1	16	1	0	0	0	0

SD, standard deviation.

Table IV
Mechanisms of injury responsible for shoulder and elbow physeal fractures in the 2 studied periods

	Cases	M	F	Mean age (SD)	Accidental fall	Sport trauma	Accident at school	High energy	Fall from height
Shoulder physeal fractures									
No COVID-19 period	1	1	0	14	0	0	1	0	0
COVID-19 period	0	0	0		0	0	0	0	0
Elbow physeal fractures									
No COVID-19 period	0	0	0		0	0	0	0	0
COVID-19 period	0	0	0		0	0	0	0	0

SD, standard deviation.

Table V
Mechanisms of injury responsible for shoulder and elbow sprains/subluxations in the 2 studied periods

	Cases	M	F	Mean age (SD)	Accidental fall	Sport trauma	Accident at school	High energy	Fall from height
Shoulder subluxations									
No COVID-19 period	0	0	0		0	0	0	0	0
COVID-19 period	1	0	1	2	1	0	0	0	0
Elbow subluxations (only radial head subluxations)									
No COVID-19 period	2	0	2	4 (1)	1	1	0	0	0
COVID-19 period	1	1	0	5	1	0	0	0	0

SD, standard deviation.

Our trauma center is a certified COVID-19-free unit of a highly populated area, thus attracting all traumatized patients; this aspect makes our study methodologically valid for evaluating the COVID-19 impact. In our trauma center, during the C19 period, we performed 69% fewer services than the same period of the previous year. The reduction also affected the performance aimed at the treatment of shoulder and elbow injuries (−65%). Data relating to the decrease in total treatments in the pediatric population are

Table VI
Mechanisms of injury responsible for shoulder and elbow dislocations in the 2 studied periods

	Cases	M	F	Mean age (SD)	Accidental fall	Sport trauma	Accident at school	High energy	Fall from height
Shoulder dislocations									
No COVID-19 period	1	0	1	16	0	1	0	0	0
COVID-19 period	0	0	0	–	0	0	0	0	0
Elbow dislocations									
No COVID-19 period	0	0	0	–	0	0	0	0	0
COVID-19 period	0	0	0	–	0	0	0	0	0

SD, standard deviation.

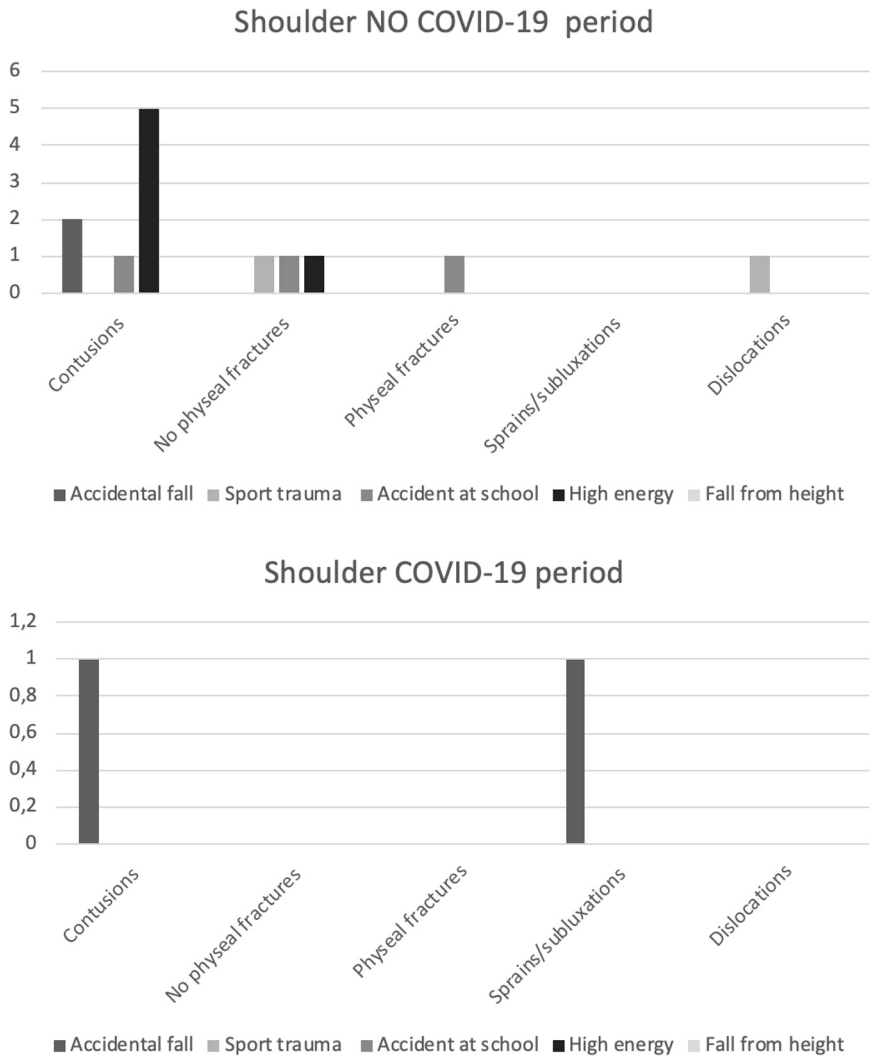

Figure 2 Distribution of the trauma mechanisms in the 5 shoulder diagnostic groups in the 2 studied periods.

even more striking: −84.6%, whereas the reduction for shoulder and elbow care was in line with that recorded in the adult population: −66%.

The fear of a possible contagion played an important role. Parents of pediatric patients, whose children suffering minor trauma or low-intensity pain, were probably discouraged from bringing their sons/daughters to trauma centers. On the contrary, they would not hesitate to bring their sons/daughters to the trauma unit in the NC19 period thanks to the principles of our National Health System based on communal, rather than individual, ideas of success and care. Recently, Bram et al[2] examined the impact of COVID-19 on fracture incidence and characteristics, founding a 2.5-fold decrease during the pandemic. Unfortunately, their evaluation was not extended to all orthopedic trauma injuries; sprains, dislocations, and contusions were not analyzed.

In literature, there is a tremendous amount of information about the causes predisposing to the shoulder and/or elbow trauma in the skeletally immature population. It is ascertained that reasons are mainly attributable to recreational activities and school traumas in patients of early and second childhood, whereas for adolescents, sports injuries and traffic accidents (falls from bicycles or motor vehicles) are the most frequent traumatic mechanisms.[1,3–14,17] The lockdown period, characterized by the closure of schools, public parks, and sports clubs and by the prohibition of events that could

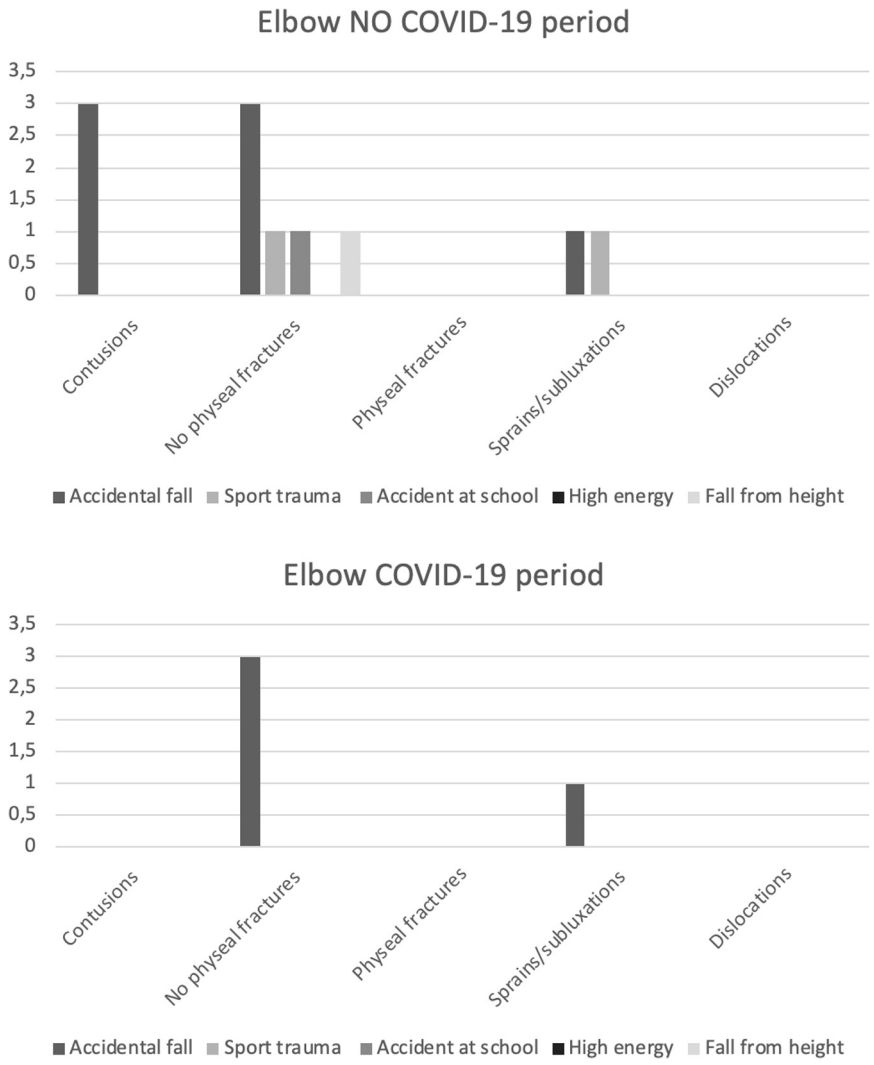

Figure 3 Distribution of the trauma mechanisms in the 5 elbow diagnostic groups in the 2 studied periods.

aggregate people outside the family unit (scouting, religion, music, and various art courses), has substantially eliminated most of the activities at risk for shoulder and elbow injuries.

Four considerations emerge from our analysis:

(1) during the C19 period, there were no fractures, physeal fractures, and dislocations of the shoulder;
(2) no cases of contusions, physeal fractures, and dislocations of the elbow; and
(3) we observed the absence of high-energy, sports, and school injuries; and
(4) during the pandemic, shoulder and elbow injuries mainly occurred as a result of accidental fall at home.

Individual freedom, education, and job represent some of the characteristics of our lifestyle. They have been obtained over time and at the cost of sacrifices made by our predecessors. Therefore, it would be foolish to conclude that to avoid suffering from shoulder and elbow injuries, our young people should renounce these social achievements. However, the pandemic forced us to become aware of the ways and places where skeletally immature subjects report shoulder and elbow traumas; therefore, it would be desirable that more considerable attention be directed toward the prevention of injury in areas at risk.

Disclaimer

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