

Impact of the SARS-CoV-2 pandemic on pediatric trauma injuries requiring surgery in Germany.

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Abstract

Introduction: The lockdown caused by the SARS-CoV-2 coronavirus has prompted drastic public health measures by governmental organizations which impacted especially daily life for children around the world. The aim of this study was to investigate the effect of closure of schools and kindergarten as well as restriction of leisure activities on the epidemiology of pediatric trauma injuries.

Methods: This is a retrospective cohort study comparing all pediatric trauma admissions and surgical intervention in two level one pediatric trauma centre in Germany during the first lockdown in 2020 with the same pre-pandemic period in 2019.

Results: During lockdown emergency consultations decreased by almost 30%. The rate of domestic (63% vs. 29%) and traffic accidents (8% vs. 12%) increased while injuries caused by sports, on playgrounds and in school and kindergarten decreased. The patients mean age was reduced (5.78 yrs vs. 4.55 yrs) with an increase in injuries especially in toddlers. Soft tissue injuries were more frequent (25% vs. 30%) than in pre-pandemic time. The number of patients requiring surgical interventions rose (40 vs. 62) in time of lockdown; especially soft tissue interventions and injuries caused by home accidents increased.

Conclusion: The SARS-CoV-2 lockdown has resulted in an increase in domestic accidents, especially in toddlers. Injuries requiring surgical interventions were more common, which can probably be explained by changes in parental supervision, leisure activities and as a result of a loss of fundamental movement skills due to a lack of physical activity in preschool.

Keywords: Pediatric, Traumatology, SARS-CoV-2, Lockdown, Epidemiology, Pandemic.

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Introduction

Since the first case of the novel coronavirus SARS-CoV-2 was reported in China in December 2019, the viral infection has been declared as a global pandemic by the World Health Organization on March 16 2020 [1]. The relatively high morbidity (10% to 15%) and mortality (0.25% to 4%) of SARS-CoV-2 compared with seasonal influenza has prompted drastic public health measures by governmental organizations [2]. The increasing infection rates quickly led to a global containment policy through social distancing practices. Several countries have gone through periods of being under lockdown with restrictions for public and social life requiring the population to remain at home to “flatten the curve”.

Especially children’s live have been drastically affected by the lockdown. In addition to general activity limitations this included kindergarten and school closures and also enormous restrictions on afterschool activities as past experience with viral pandemics such as the 2009 H1N1-outbreak has shown this as a potential intervention in partial containment [3,4]. Several studies reported a significant decrease of traumatic injuries in children [5-13] as accidents in school, on

playgrounds and other leisure activities most frequently lead to traumatic injuries in childhood [14]. This exceptional situation led to a change in the epidemiology of childhood trauma. As far as we are aware there is no valid data collection for Germany yet. Therefore, the aim of this study was to examine how the SARS-CoV-2 pandemic have impacted the incidence, severity and characteristics of pediatric trauma injuries presented to a single level one pediatric trauma centre in Germany compared with the same period during 2019.

Methods

We performed a retrospective, comparative, epidemiological analysis assessing all acute pediatric trauma admissions in the first 8 weeks of a nationwide lockdown in Germany. This study was submitted to the ethics committee of the Hamburg medical association (WF-049/20) and approved.

All acute pediatric admissions for trauma to the level one pediatric trauma department of the university hospital of Hamburg and altonaer children’s hospital in Hamburg, Germany were analysed between March 16, 2020 and May 10, 2020. These results were then compared with the pre-pandemic

period during 2019. All patients aged 0 to 16 who suffered from an accident were included; exceptions were patients with a severe major poly trauma or admissions only for wound and plaster control. The data sets were collected from electronic health record documentation in the emergency department and operating theatre. Demographic variables collected included patient age at injury and sex. Age categories were then created on the basis of the centres for disease control child development grouping [15]. Hospital-specific data included

injury locations, location and type of injury. Injuries were differentiated into fractures, contusions and strains as well as soft tissue injuries. The classification of the individual injuries was based on the international statistical classification of diseases and related health problems (10th revision German modification (ICD-10-GM) version 2020). Injuries were grouped by body region using the ICD-10-Code (Table 1). Injuries that underwent surgical interventions were documented.

	Comparison period 2019	Lockdown 2020	p-value
Total of patients	1326	1044	-
Daily incidence of presentation:	15.54 (\pm 5.06)	8.93 (\pm 3.65)	<0.001
Average (SD)			
Age (years): Average, (SD)	5.78 (\pm 4.37)	4.55 (\pm 3.99)	<0.001
Age group: 0 to 5 years	693 (52.26)	602 (57.66)	<0.05
Age group: 6 to 12 years	441 (33.26)	300 (28.74)	<0.05
Age group: 13 to 16 years	192 (14.48)	142 (13.60)	0.54
Manchester triage: average (SD)	3.64 (\pm 0.80)	3.11 (\pm 1.54)	<0.001
Sex (%)			
Male	766 (57.77)	592 (56.70)	0.6
Female	560 (42.23)	452 (43.30)	
Type of injury (%)			
Fractures	203 (15.31)	166 (15.90)	0.69
Contusions and strains	784 (59.12)	570 (54.59)	0.08
Soft tissue injuries	339 (25.56)	308 (29.50)	<0.05

Table 1. Demographic variables in pre-pandemic and pandemic period.

Continuous data were tabulated and analysed. Data were presented as absolute numbers, proportion (%), average, and standard deviation. 2019 and 2020 data were compared and statistically tested using the independent-samples students test for normally distributed data. Categorical data was compared using chi squared test. All comparative tests were two-tailed with a significance threshold of $p < 0.05$. Statistical analyses were conducted utilizing IBM SPSS statistics for Macintosh, version 26.0 (IBM Corp., Armonk, NY).

Results

The study in total included 2370 patients with acute pediatric trauma consultations. During lockdown there was a significant

decrease of 27% of presentations in the emergency room compared to the same period in 2019 (Table 2). This was particularly evident in the 6 to 12 year old age group (441 vs. 300; $p < 0.05$), whereas there were more injuries in the 0 to 5 year old age group (693 vs. 602; $p < 0.05$). The average age of injured children was significantly lower during the lockdown (5.78 ± 4.37 vs. 4.55 ± 3.99 ; $p < 0.001$). The daily incidence of presentations during the pandemic of all patients was also significantly reduced (15.54 ± 5.06 vs. 8.93 ± 3.65 ; $p < 0.001$) with a significant reduction in Manchester triage, which is an indication of serious overall injuries (3.64 ± 0.80 vs. 3.11 ± 1.54 ; $p < 0.001$). There were no gender differences between the cohorts ($p = 0.60$).

	Comparison period 2019	Lockdown 2020	p-value
Operations (% of all injuries)			
Total	40 (3.00)	62 (6.00)	<0.001
Fractures (%)	27 (67.5)	30 (48.29)	0.20

Soft tissue injuries (%)	13 (32.5)	32 (51.61)	<0.001
Operations per age group (%)			
Age group: 0 to 5	14 (35.00)	32 (51.61)	0.01
Age group: 6 to 12	16 (40.0)	21 (33.87)	0.52
Age group: 13 to 16	10 (25.00)	9 (14.52)	0.18
Mean Age (SD)	7.67 (± 4.47)	5.93 (± 3.89)	<0.05
Operations per injury location			
Home	7 (17.50)	27 (43.55)	<0.001
Playground	7 (17.50)	6 (9.67)	0.25
Sports	9 (22.50)	7 (11.30)	0.13
Traffic	6 (15.00)	13 (21.00)	0.45
Kindergarten/School	11 (27.50)	10 (16.13)	0.1

Table 2. Proportional comparison of surgical cases in 2019 and 2020.

The location of injury was found to differ between lockdown and pre-pandemic period (Figure 1). There was a significant increase in the proportion of injuries occurring in or around the home (28.88% vs. 63.12%; p<0.001) and in traffic accidents (8.07% vs. 11.78%; p<0.05). Children during the pandemic were less frequently injured during sports (12.82% vs. 10.15%; p<0.05), on playgrounds (10.86% vs. 6.51%; p<0.001) and in kindergarten and school (34.16% vs. 5.07%; p<0.001). There was no difference in the incidence of fractures (15.31% vs. 15.90%; p=0.69) and contusions and strains (59.12% vs. 54.59%; p=0.08) during lockdown. However, there was a significant increase in soft tissue injuries (25.56% vs. 29.50%; p<0.05).

During lockdown children were injured at home (63% vs. 29%, p<0.001) and during traffic (12% vs. 8%, p<0.05) and less often during sports (10% vs. 13%; p<0.05), on playgrounds (6.51% vs. 10.86%; p<0.001) and in kindergarten and school (5.07% vs. 34.16%; p<0.001).

The proportion of injuries to the upper extremity (p=0.665) and the lower extremity (p=0.281) showed no difference compared to 2019 (Table 3). Injuries to the head accounted for the largest proportion of injuries in lockdown as well as in 2019 (49.44% vs. 51.91%).

This was followed by injuries to the elbow/forearm (12.60% vs. 11.30%), injuries to the wrist/hand (12.00%, 12.00%) and injuries to the ankle/foot (9.10% vs. 10.00%). Significant differences could only be demonstrated for injuries to the Knee/Lower leg (6.90% vs. 4.30%; p<0.05).

Furthermore, we did not see any changes in any of the other body regions compared to the pre-pandemic period in 2019 (neck: 1.05% vs. 1.70%; chest: 0.80% vs. 1.10%; abdomen/pelvis/spine: 3.20% vs. 2.00%; shoulder/upper arm: 4.40% vs. 4.00%; hip joint/thigh: 1.05% vs. 1.00%).

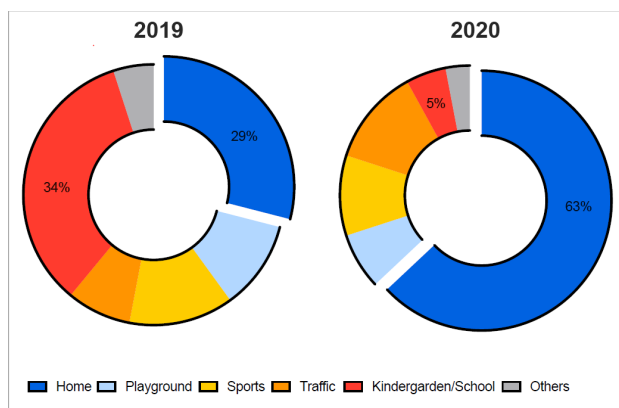


Figure 1. Injury locations in pre-pandemic and pandemic period: Lockdown measures affected accident location of injuries in children.

	Comparison period 2019	Lockdown 2020	p-value
Injuries to body regions (%)			
Head	657 (49.55)	542 (51.91)	0.598
Neck	23 (1.70)	11 (1.05)	0.166
Chest	15 (1.10)	8 (0.80)	0.368

Abdomen/pelvis/thoracic and lubar spine	27 (2.00)	33 (3.20)	0.083
Sholder/upper arm	53 (4.00)	46 (4.40)	0.621
Elbow/forearm	167 (12.60)	118 (11.30)	0.337
Wrist/hand	159 (12.00)	126 (12.00)	0.954
Hip Joint/thigh	13 (1.00)	11 (1.05)	0.859
Knee/lower leg	91 (6.90)	45 (4.30)	<0.05
Ankel/foot	121 (9.10)	104 (10.00)	0.49
Upper extremity	379 (28.50)	290 (27.70)	0.665
Lower extremity	225 (17.00)	160 (15.30)	0.281
Others	722 (54.36)	594 (56.89)	0.218

Table 3. Injury characteristics in pre-pandemic and pandemic time period.

During the lockdown more patients required operative intervention (3.00% vs. 6.00%; $p < 0.001$) compared with 2019 (Table 2), which was due to an increase in soft tissue interventions (32.5% vs. 51.61%; $p < 0.001$). The age group of 0-5 year olds was particularly affected ($p = 0.1$). However, there was a clear reduction in the patients mean age requiring an operation (7.67 ± 4.47 vs. 5.93 ± 3.89 ; $p < 0.05$). Injuries sustained by domestic accidents during lockdown required more surgical interventions compared to the previous year (17.50% vs. 43.55%; $p < 0.001$), while otherwise the injuries in traffic accidents, in sports, on playgrounds and in school and kindergarten did not change substantially (Table 2).

Discussion

The SARS-CoV-2 pandemic has impacted all aspects of daily life, especially for children. With the combination of the closure of schools and kindergarten, public parks, playgrounds and many other facilities as well as the indefinite disbanding of organized sports, changes in the epidemiology of pediatric trauma injuries was expected. Several countries around the world have studied the local effects of SARS-CoV-2 lockdown on pediatric and adult traumatology patients. Most studies reported a decrease of emergency consultations in Spain [16] and fractures in children in New Zealand [5]. This resulted in a simultaneous decrease in surgical interventions for trauma cases in 30%-60% [6-13]. Only, two studies found an increase in domestic's accidents (23% vs. 59%) requiring surgery compared to recreational sports accidents (24% vs. 2%). Moreover, an increase in home trampoline injuries were reported [12].

The present study found a decrease in the pediatric trauma emergency consultations of almost 30%. This may be explained by the closure of schools and kindergartens, public parks and playgrounds and recreational sports, which has already been reported [6,14,17]. In addition, the decline in emergency consultations can be explained by the fear of possible infection in the hospital, which may have discouraged families with minor injuries. This is reflected by a lowered

mean value of the Manchester triage and could already be shown in the context of the current pandemic as well as previous epidemics like the H1N1 outbreak in Hong Kong [18], Taiwan [19] or Turkey [20,21] in in 2009.

In contrast to previous reports, the number of injuries in which surgery was required increased significantly in the current study; especially, in the age group of 0-5 year olds. Most notably, an increase in soft tissue injuries requiring surgery was found, which was also see in the study by Bolinger et al. [13]. This may be explained by the fact that in comparison to many other studies, our work included not only injuries to the extremities, but also injuries to other body regions such as to the head and face, which often occur particularly in preschool children (<5 years) at home [22-24].

The frequent occurrence of wounds at the head in toddlers can certainly be explained by the disproportionately large head and with the lack of coordination and fundamental movement skills. Fundamental Movement Skills (FMS) are the basic building blocks required for mastering the complex, task-specific movements needed for participation in sports, playing and other activities [25]. FMS consist of object control (e.g. throwing or catching a ball or ball skills), loco motor (e.g. running, hopping, skipping), and stability (e.g. balance) skills [26]. The appropriate development of FMS, which occurs during the preschool period (children aged 3-5 years) through copying and repetitive exercise, allows building the basis for performing complex movements and task-specific abilities [27-30]. Moreover, several studies reported that the practice of physical activity in preschool improves FMS level by inducing a higher motor skill competence in childhood [31-34]. For these reasons, the practice of structured physical activity in kindergarten during this period results to be crucial [35-38]. Physical activity of 15 to 20 minutes 4 days a week is enough to improve fundamental movement skills and therefore motor development [39]. The absence of fine motor development was found by Myhre et al. to be the cause of an increased risk of injuries in toddler's [40]. Toddlers' physical development often precedes their ability to understand the consequences of their actions, and early physical mobility can significantly increase the risk of injury to children. An impaired fine motor development may be linked to clumsiness, leading to injury

proneness. As children were deprived from typical motor activities during lockdown measure, lack of FMS may explain the increase of severe injuries resulting in surgery during the pandemic [41].

In addition, children may be looked after differently at home by their parents than in kindergarten or school. It has been reported that mothers have to organize home office, housekeeping and child care simultaneously which little external support by other family members and social support systems [42]. Adequate adult supervision is essential for toddlers to stay free from harm [43-45]. Many domestically injuries among young children are the results of inadequate supervision. Differences in parental supervision or the possibility that older siblings sometimes act as chaperones may also explain the increased injury rate in our cohort. It has been reported that children may behave more riskily and show poor compliance if they are supervised by their sibling's. In addition, due to the lack of leisure activities and sports, children are underutilized, which can lead to impulsiveness and carelessness, which may contribute to the tendency of children to put themselves in potentially dangerous situations.

Conclusion

The present study shows a decrease in pediatric emergency consultations during lockdown of almost one third with a significant decrease in the proportion of injuries occurring during sports, on playgrounds and in kindergarten and school. There was an increase in accidents at home, with younger children in particular being affected. Soft tissue injuries were more frequent than in pre-pandemic time. Above all, the rate of surgically treated injuries rose in times of lockdown, which can probably be explained by changes in supervision, leisure time activities and as a consequence, in motor skills. These findings could help health authorities and scientific societies to develop public information campaigns to prevent domestic accidents in young children and to provide support for parents during times of pandemics.

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