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Title

Rate and severity of radiological features of physical abuse in children during the first UK wide covid-19 enforced national lockdown

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Abstract

Rate and severity of radiological features of physical abuse in children during the first UK wide covid-19 enforced national lockdown

Objective To assess the number, type and outcome of radiological investigations for children presenting to hospital with suspected physical abuse (SPA, including abusive head trauma) during the first national covid-19 enforced lockdown, compared to the pre-lockdown period.

Design Multicentre, retrospective, observational interrupted time-series analysis.

Setting Eight secondary/tertiary paediatric centres between January 2018 and July 2020 inclusive.

Participants 1587 hospital assessed children undergoing radiographic skeletal surveys (SkS) and head CT imaging performed for SPA/child protection concerns.

Main outcome measures Incidence and severity of fractures identified on SkS; head injury (comprised of incidence rates and ratios of skull fracture, intracranial haemorrhage [ICH] and hypoxic ischaemic injury [HII]) on head CT imaging; and ratio of ante- and post-mortem skeletal surveys.

Results 1587 SkS were performed: 1282 (81%) antemortem, 762 (48%) male, positive findings in 582 (37%). Median patient age 6 months. There were 1.7 fractures/child pre-lockdown versus 1.1 fractures/child during lockdown. There was no difference between positive/negative SkS rates, the absolute ratio of ante-/post-mortem SkS or absolute numbers of head injury occurring between January 2018 and February 2020, and the lockdown period April to July 2020. Likewise, pre-lockdown incidence and rates of skull fracture 30/244 (12%), ICH 28/220 (13%) and HIE 10/205 (5%) were similar to lockdown, 142/1304 (11%), 171/1152 (15%) and 68/1089 (6%), respectively.

Conclusion The first UK covid-19 lockdown did not lead to increase in either the number of ante- or post-mortem radiological investigations performed for SPA, or the number or severity of fractures and intracranial injuries identified by these investigations.

Competing interest statement

All authors have completed the ICMJE uniform disclosure form at www.icmje.org/coi_disclosure.pdf and declare: no support from any organisation for the submitted work; RAD has received research grants from the NIHR, CCLG, MS Society, and Action for A-T; ACO has received research grants from the NIHR, The Children's Hospital Charity, Alexion, and OfS; DJAC has received payment for expert testimony in relation to birth injury cases; SMS, CL, KH, AO, NS, and ACO have received payment for expert testimony from Her Majesty's Courts and/or the Police; CL has either been paid or reimbursed with an honorarium for lecturing and teaching on the subject of imaging in inflicted injury; SMS and ACO have been paid for developing and delivering educational presentations for InfoMed; ACO does consultancy for Alexion and BioMarin; MP is a member of the ESPR Education Committee; ACO is the Chair of the ESPR Child Abuse Taskforce and the Skeletal Dysplasia Group for Teaching and Research; no other relationships or activities that could appear to have influenced the submitted work.

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Contributorship statement

Guarantors of integrity of the entire study – SMS

Study concepts and design – SMS, MP, HC, DJAC, RDi, KJ, CL, AO, ACO

Literature research – SMS, ACO

Clinical/experimental studies – SMS, MP, HC, DJAC, RAD, RDi, HE, EE, KH, KJ, CL, AO, NS, ACO

Data analysis – SMS, AR

Statistical analysis – AR, SMS

Manuscript preparation – SMS, MP, ACO, AR

Manuscript editing – SMS, MP, AR, HC, DJAC, RAD, RDi, HE, EE, KH, KJ, CL, AO, NS, ACO

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Introduction

Factors that increase individual and societal stress and inequities have been amplified by the covid-19 pandemic and consequent lockdowns. These have been summarised and discussed

by several authors worldwide[1 2] and include (amongst others) isolation and reduced access to support systems, financial strain, and parental depression. In one study, total aggression score and individual scores for all 4 domains of physical aggression, verbal aggression, anger, and hostility were shown to have increased during the covid-19 lockdowns.

A rapid systematic review (Rapp *et al*) found that children are particularly vulnerable during the covid-19 pandemic as increased parental stress resulting from enforced national lockdowns and reduced access and presentation to 'mandated reporters' may increase rates of child maltreatment.

This increased stress in the home could lead to an increase in incidence of domestic violence and child abuse,[4-6] prompting development of guidelines for child safeguarding during the covid-19 pandemic, such as those published in the United Kingdom (UK) by the Royal College of Paediatrics and Child Health.[7] However, during the most recent (covid-19) pandemic surges, studies have generally shown no effect, or reduced effect of lockdowns/crises on the incidence of paediatric trauma and physical child abuse in regards to traumatic injury that is seen presented to healthcare institutions. For example, in the United States of America (USA) and Canada, studies have shown an overall reduction in childhood trauma volume during lockdown with a reduction in nonviolent trauma[8], no increases in inflicted injury[9,9,10] , an increase in sexual abuse[10], but reduced numbers of children investigated for abuse.[10-10.] However, Salt *et al*, when comparing child abuse and neglect encounters before and after school closings due to SARS-Cov-2, found that episodes of abuse increased in severity with a resultant increase in inpatient admissions.[11]

A cross-sectional retrospective observational study from Brazil (Oliveira *et al*) in individuals less than 18 years of age found that there was a decrease in the absolute numbers of presentation of children to the Emergency department during the covid-19 pandemic when compared to the same quarterly time points over the preceding 3 years, there was a significant increase in the

relative percentage of the number of visits due to violence. There was no association between the incidence of physical violence and socioeconomic and demographic factors.

No case of child abuse presented to the Emergency Department of the University Hospital of Central Friuli during Italy's first period of strict lockdown – a lockdown that extended over two months and one week from 9th March to 10th May 2020[12]. In France, one study that specifically assessed emergency department attendances, showed that the lockdown confinement increased the incidence of burns but not of any other childhood trauma.[13] Indeed, the significant reduction in supervision orders issued between March and May 2020 (24) compared to the same period for 2019 (136), prompted authors of another French study to question whether cases of child abuse were being undetected during lockdown.[3]

One exploratory study (Moore *et al*) examining police referrals from domestic abuse before and during the first enforced national lockdown in South Wales, UK, found increased third-party of reporting by children. Whilst this may suggest an increased exposure to domestic violence, the absolute number reports by children were small and may not be applicable to other parts of Wales or the rest of the UK. Moreover, researchers in the UK reported an overall decrease in paediatric trauma and child protection medical examination referrals during lockdown compared to pre-lockdown periods.[14,15]

Whilst several studies in many countries across the world have shown that the 2020 covid-19 pandemic lockdowns did not increase the incidence of child physical abuse they questioned whether abuse severity may have increased or indeed gone undetected.

An interrupted time series study in the USA (De Boer *et al*) found that whilst there was a significant decrease in the presentation of children with traumatic injuries (physical abuse) (to tertiary children's hospitals during the covid-19 pandemic. However, those children less than 5 years of age that were presented, the cases were more likely to be severe in nature with increased odds of those children requiring an intensive case admission and suffering a traumatic brain injury.

A further study in the USA (Maassel *et al*) found a significant decrease in AHT admissions in children less than 5 years of age across 49 children's hospitals during the covid-19 pandemic during the 11th March to 30th September 2020 lockdown period when compared to the same timepoint over the preceding 3 years. They found that hospitalised children with AHT had a shorter length of stay and lower mean monthly admission. Moreover, there were no significant difference between percentage of intensive case stay, ventilator use, subdural haemorrhage, retinal haemorrhage and mortality.

In contrast, the UK authors, Sidpra *et al*,[16] reported a 1493% increase in the number of children referred to their centre with suspected abusive head trauma (AHT) between 23rd March and 23rd April 2020, compared to the previous 3 years. If this is a true reflection of the situation, then there would be resultant significant policy implications.

The authors of this paper are practising <BLINDED> across 8 major paediatric centres in England, UK. They have an interest in <BLINDED>, as well as providing <BLINDED>. The majority are active members of the <BLINDED>. which ran virtually during the lockdown period. It was not the subjective feeling of the authors that there had been a significant increase in AHT (or other forms of physical child abuse) in any of the participating peer review centres; however, in light of the Sidpra *et al*[16] paper, it was felt that this subjective view required validation.

We sought to determine the number of children (under the age of 18) presenting to multiple hospitals across England with suspected inflicted trauma. This multicentre, retrospective, observational interrupted time-series analysis compared the investigation rate for, and severity of, injury (on the basis of imaging findings alone) during the first UK-wide covid-19 enforced national lockdown (23rd March to 4th July 2020) with pre-lockdown rates. We used radiographic skeletal surveys (SkS) and head CT imaging findings as surrogate markers to extrapolate rates and severity of injury over the period of the first lockdown in the UK,

compared to rates and severity of injury immediately preceding lockdown and extending back to 1st January 2018.

Methods

Patient and Public Involvement

This observational study was based on data acquired as routine standard of care with information extracted from the routine healthcare radiology records. No patients or members of the public were directly involved. Following NHSX guidance, the use of patient data for this covid-19 related project was allowed without consent or the requirement for Confidentiality Advisory Group approval (https://www.hra.nhs.uk/covid-19-research/guidance-using-patient-data/).

Identification of absolute numbers of children presenting to hospital with possible physical abuse

Participating centres included <BLINDED> forming part of the <BLINDED> Child Protection Peer Review. Each of the 8 participating unit's computerised radiology information systems (CRIS) was queried to provide lists of all radiographic SkS performed between January 2018 and July 2020 inclusive in any patient under 18 years of age For each SkS identified (initial and follow-up), the issued radiology reports were retrieved and manually reviewed by the authors, all <BLINDED>. In accordance with national guidelines in the imaging investigation of suspected physical abuse in children,[17] in all participating centres each SkS had been double reported by consultant paediatric radiologists whose day-to-day practice includes the reporting of SkS for suspected inflicted trauma. This double reporting practice is confirmed as having continued during the lockdown period. The source imaging data was not re-reviewed for the purposes of this study.

SkS that had been undertaken for reasons other than suspected inflicted trauma, e.g., those performed for assessment of a possible skeletal dysplasia, were excluded. In addition, cases were excluded if there was uncertainty from the CRIS record as to why the SkS had been undertaken. Finally, the CRIS system was searched to identify which children undergoing a SkS also had a contemporaneous head CT examination as part of their suspected inflicted trauma investigations as per the national guidelines on the imaging investigation in cases of suspected inflicted traumatic injury in children.[17]

Potential for confounding effect of injury severity

The number of children requiring hospital assessment in the form of a SkS was used as a surrogate marker for the number of cases of inflicted trauma in the community. To capture the severity of abuse, we recorded whether the SkS were conducted ante- or post-mortem and the number of fractures per child. We also recorded features of intracranial injury identified on head CT imaging. The full dataset is found in table 1. In cases where there were differing findings on follow-up imaging, e.g., new fractures not seen on the initial SkS (one of the primary reasons for undertaking such follow-up imaging in this cohort of patients), the absolute total number of fractures for each child was recorded against the timepoint at which the initial SkS occurred. If a child presented and was investigated for suspected physical abuse more than once over the study period, each separate investigation was recorded.

Statistical analysis

Time periods of analysis

Retrospective data collection between January 2018 and July 2020 inclusive was performed. The data could be considered as a timeseries with multiple possible change points, given that some restrictions began on the 16th March 2020, with full lockdown occurring on March 23rd 2020. Hence, we considered the whole of the month of March 2020 as a changing period

(rather than a point) to allow the separation of data before and after lockdown. Given the possibility for a "rebound effect" following cessation of lockdown, we also collected data for July 2020. Thus data for January 2018 to February 2020 ("pre-lockdown") was compared to that from April 2020 to July 2020 ("lockdown").

The time series were tested for autocorrelation and seasonality with comparison by *t*-test. Segmented linear regression was used to evaluate the effect of lockdown on the level and trend of SkS numbers or abnormal SkS. Analyses were performed in R (R Core Team (2021). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/)

Specific data analysis

We analysed the number of SkS, rate of abnormal SkS, rate of post-mortem SkS and the number of fractures identified on SkS. Regarding head injury, we collected the incidence rates of skull fracture, intracranial haemorrhage, and hypoxic ischaemic injury to the brain, as identified on head CT imaging. As well as analysing the ratios of each individual feature of head injury, these findings were amalgamated into a combined feature of "head injury", where positivity was defined as at least one feature being positive for a single child.

Results

Cohort size and demographics

During the study period (1st January 2018 to 31st July 2020), 1587 children had a SkS performed due to child protection concerns across all participating centres. The estimated UK population served by these centres is 15,695,126. The number of SkS undertaken per month ranged from 36-74, with a mean of 51 per month averaged across all centres. Over the study period, 1282 SkS (81%) were performed in live children with the remaining 305 (19%) having been post-mortem studies. The median patient age was 6 months (range 1 day–16 years). Male patients

accounted for 762 (48%) of the study population. Across the whole study cohort, positive findings were identified in 582 cases (37%, table 2).

Summary statistics

Considering the pre-lockdown time-period of 1st January 2018 to 28th February 2020, there were 838 skeletal fractures in 491 children (1.7 fractures per child). This compared to 94 fractures in 80 children over the course of the lockdown period of April 2020 to July 2020 inclusive (1.1 fractures per child). Figures 1 and 2 show the absolute numbers of normal/abnormal SkS and pre-/post-mortem SkS over the study period. The summary statistics for number of SkS, rate of abnormal SkS, rate of post-mortem SkS, number of fractures and number of fractures per child are presented in table 3 with no pre-/lockdown comparison reaching statistical significance.

Combining skull fracture, intracranial haemorrhage, and hypoxic ischaemic injury findings into a single diagnosis of "head injury", there was again no significant difference (p=0.43) in terms of absolute positive events over the lockdown period compared to the pre-lockdown period (table 4). During lockdown, the incidence and rates of specific head injury features were skull fractures 30/244 (12%), intracranial haemorrhage 28/220 (13%), and hypoxic ischaemic injury 10/205 (5%). This was similar to the pre-lockdown rates of 142/1304 (11%), 171/1152 (15%) and 68/1089 (7%), respectively (figure 3).

Segmented linear regression

In regard to analyses over time, there was no statistical suggestion for autocorrelation or seasonality (all p values >0.05) for total number of SkS, rate of abnormal SkS, rate of post-mortem SkS, average number of fractures per child or total number of fractures.

Examining the total number of SkS (figure 4), there was a slow downward trend before lockdown. Although there seemed to be a change in trend after lockdown, this trend was not

statistically significant with *p* value >0.1 and the plot suggests that the numbers were rising prior to lockdown in around February 2019, with a large amount of fluctuation.

The plot for the rate of abnormal SkS over time (figure 5) shows no significant change in level or trend. In fact, the trend goes down after lockdown and up again after the lifting of restrictions, but no change is statistically significant.

Finally, considering the results for the rate of post-mortem SkS, total fractures and average fractures per child (figures 6-8) there appears to be a sharp downward change in trend after lockdown. Given the large amount of fluctuation over time, any trend must be interpreted with caution and again none of these reached statistical significance.

Discussion

This study has shown that during the lockdown and immediate post-lockdown period in England (April to July 2020), there was no increase in numbers of SkS performed in children; no significant change in the ratio of SkS performed in live versus post-mortem children (to indicate an increase in death rates in children attributable to a possible inflicted traumatic aetiology); no significant change in the rates of number of skeletal fractures per child (to indicate a change in severity of such injuries in a non-lethal setting); and no appreciable change in incidence or severity of head injuries.

Whilst several researchers have used differing metrics, they conclude that their respective 2020 covid-19 induced lockdowns did not increase the absolute incidence of child physical abuse. This is the first study to analyse SkS referral patterns and findings (including both ante- and post-mortem) in a hospital setting to answer this question. Our findings are in keeping with those provided from other clinical domains, e.g., Accident and Emergency department attendances of live children, mirroring the findings seen in several other countries. Given these results, how can we explain the reported increases in institutional referrals for suspected AHT between 23rd March and 23rd April 2020?[16] Explaining this disparity is vital if future clinical

guidelines are to be appropriately evidence based. If such significant increase in cases were a true reflection of the situation, then there are also important national governmental policy implications.

In their correspondence, Sidpra *et al.*[16] identified ten cases of suspected AHT over the one-month lockdown period compared to an average of 0.67 cases per month in the same period of the previous three years. During the first wave of the covid-19 pandemic, significant pressures were placed on all local and regional healthcare units. To mitigate the increase in severely unwell adults who formed the overwhelming majority of cases admitted to hospitals in England, there was significant re-organisation of services on a district wide level. For example, because the impact of covid-19 on the paediatric population was mercifully low, a significant proportion of paediatric intensive care beds at multiple participating paediatric units were converted to adult beds to support an adult healthcare service in danger of becoming overwhelmed.

Caution is required in the interpretation of single institutional rates of AHT, particularly where such an institution is a major paediatric hospital in London, without an associated Accident and Emergency department and which only receives emergency cases as referrals from surrounding secondary level medical units. We hypothesise that the apparent increase in case numbers seen at this single institution over that period may be explained by transfer into their centre of paediatric cases from surrounding adult/paediatric units who had re-organised their services to cope with increasing demand for adult intensive care provision, in a similar manner to that undertaken at many of our own units.

The conclusion that the first lockdown was responsible for a significant increase in AHT as diagnosed by radiologists cannot be supported by this multi-centre review. Indeed, this study shows no evidence of an increase in any form of radiologically apparent inflicted injury (either skeletal or neurological) because of the first lockdown in England.

Strengths and limitations of study

Strengths of this analysis include the size of the study, covering a significant proportion of the major paediatric tertiary level units across England. Although NHS Hospital Trusts in London were not represented, given the size and findings presented here, in addition to the size of the major conurbations represented, we do not feel that the underlying validity of the study results are compromised in this regard. Whilst the analyses tested for an immediate rebound effect after lockdown, they have not assessed for a delayed effect beyond July 2020. These results cannot necessarily be extrapolated to the other countries within the UK. This study can only comment on the surrogate markers of abuse identified in the form of children being presented to hospital. It cannot be used to extrapolate to other forms of domestic violence which may not have resulted in paediatric hospital admission, or account for changes in referral patterns. Similarly, this study would not capture cases of children who have suffered from abuse but presented with a normal skeletal survey or head CT scan (but the rate of suspected abuse was, in any case, compared between the two timeframes and did not differ). However, future work will need to expand upon this study by correlating with the results of the child protection medical process for each child and assessing the full referral pathway.

Conclusions

This study has not identified an increased incidence of death, incidence of skeletal trauma, severity of skeletal injury nor number or severity of head injury in children investigated for suspected abuse in England during the first lockdown period compared to the preceding two years. This radiological study mirrors the findings from studies in allied clinical disciplines across the globe adding additional data regarding severity of abuse. Previous concerns regarding an increase in AHT as diagnosed by radiologists in the UK (based on a single-centre study) were likely due to the pressure on adult healthcare services necessitating reconfiguration of services to accommodate increasing numbers of adult patients and resulting in redeployment

of paediatric care in a manner that would not have ordinarily occurred, hence resulting in a positive confounding effect.

Given these findings, it would appear that the multi-factorial drivers for physical abuse of children in England leading to skeletal and or brain injury were not compounded or exacerbated by the prolonged period of initial domicile lockdown. It will be important to confirm that these findings still hold true for further lockdowns in the UK and whether there was a rebound in such events following the full cessation of restrictions in the UK in August 2021. We suggest that a nationwide study may be beneficial in this regard.

What is already known on this topic

- Lockdown due to covid-19 may have increased children's exposure to domestic violence.

What this study adds

- The rate of radiologically identified abusive head trauma in the first lockdown period did not increase.
- On the basis of this radiological study, there was no increased incidence in post-mortem imaging or live imaging for skeletal trauma, severity of skeletal injury nor head injury during lockdown, when compared to the preceding two years.
- The multi-factorial drivers for physical abuse resulting in radiological investigation of children in England were not compounded or exacerbated by the first national lockdown.

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Tables

Variable	Data Coding
Skeletal Survey date	Date
Age	Weeks
Sex	Male/Female
Ante-/Post-Mortem	A/P
Skeletal Survey Normal or Abnormal	N/A
Number Rib Fractures	Number
Number Leg Fractures	Number
Number Clavicular Fractures	Number
Number Skull Fractures	Number
Number Other Fractures	Number
Intracranial Haemorrhage	Y/N
Hypoxic Ischaemic Injury	Y/N

Table 1. Data collected following skeletal survey report review for central coding and collation.

	Normal	Abnormal	Mean Age (weeks)	Median Age (weeks)	Male	% Male	% Abnormal*
Jan-18	57	17	37.80	26.00	38	51.35	22.97
Feb-18	39	26	41.11	27.57	42	64.62	40.00
Mar-18	34	24	59.91	30.86	36	62.07	41.38
Apr-18	31	22	46.05	28.00	34	64.15	41.51
May-18	36	21	39.93	17.00	29	50.88	36.84
Jun-18	31	14	28.63	20.14	27	60.00	31.11
Jul-18	37	15	39.66	16.93	30	57.69	28.85
Aug-18	32	22	45.85	17.64	31	57.41	40.74
Sep-18	30	17	42.56	20.00	28	59.57	36.17
Oct-18	41	22	52.99	23.00	38	60.32	34.92
Nov-18	20	15	28.40	26.00	20	57.14	42.86
Dec-18	24	27	50.95	32.29	33	64.71	52.94
Jan-19	23	14	29.53	22.00	20	54.05	37.84
Feb-19	22	14	59.79	40.50	22	61.11	38.89
Mar-19	36	20	35.22	32.57	30	53.57	35.71
Apr-19	33	21	39.31	18.57	34	62.96	38.89
May-19	23	14	51.96	28.93	20	54.05	37.84
Jun-19	30	18	38.02	29.93	24	50.00	37.50
Jul-19	34	17	33.62	26.00	33	64.71	33.33
Aug-19	30	12	36.00	23.93	18	42.86	28.57
Sep-19	20	20	32.60	20.36	27	67.50	50.00
Oct-19	38	22	28.08	24.21	37	61.67	36.67
Nov-19	26	20	61.31	36.00	22	47.83	43.48

Dec-19	33	19	35.16	26.86	34	65.38	36.54
Jan-20	43	17	39.58	27.29	38	63.33	28.33
Feb-20	33	22	37.71	22.71	31	56.36	40.00
Mar-20	24	23	37.90	18.86	29	61.70	48.94
Apr-20	26	21	24.19	21.29	29	61.70	44.68
May-20	28	17	56.31	28.00	20	44.44	37.78
Jun-20	47	24	41.50	23.00	36	50.70	33.80

Table 2. Characteristics of patients presenting for a skeletal survey across all units by month of initial skeletal survey.

	Before lockdown (mean (SD))	**After lockdown (mean (SD))**
	Jan 2018-Feb 2020 (*n*=26)	**Apr 2020-Jul 2020 (*n*=4)**
Number of SkS	51.10 (9.70)	53.00 (12.10)
Rate of abnormal SkS	0.37 (0.06)	0.38 (0.05)
Rate of post-mortem SkS	0.19 (0.09)	0.16 (0.05)
Total fractures	32.00 (14.80)	23.50 (12.60)
Fracture per child	0.63 (0.28)	0.43 (0.17)

Table 3. Summary time period findings pre-lockdown and during lockdown. The data was compared using a *t*-test and all *p* values >0.5.

	Pre-lockdown			Lockdown			*p*
	Number of diagnostic scans	Number abnormal	Rate (%)	Number of diagnostic scans	Number abnormal	Rate (%)	
Fractures	1304	142	10.9	244	30	12.3	0.60
Intracranial Haemorrhage	1152	171	14.8	220	28	12.7	0.58
Hypoxic Ischaemic Injury	1089	68	6.2	205	10	4.9	0.91

Table 4. Rates of cranial/intracranial injury for pre-lockdown versus lockdown periods.

Figures

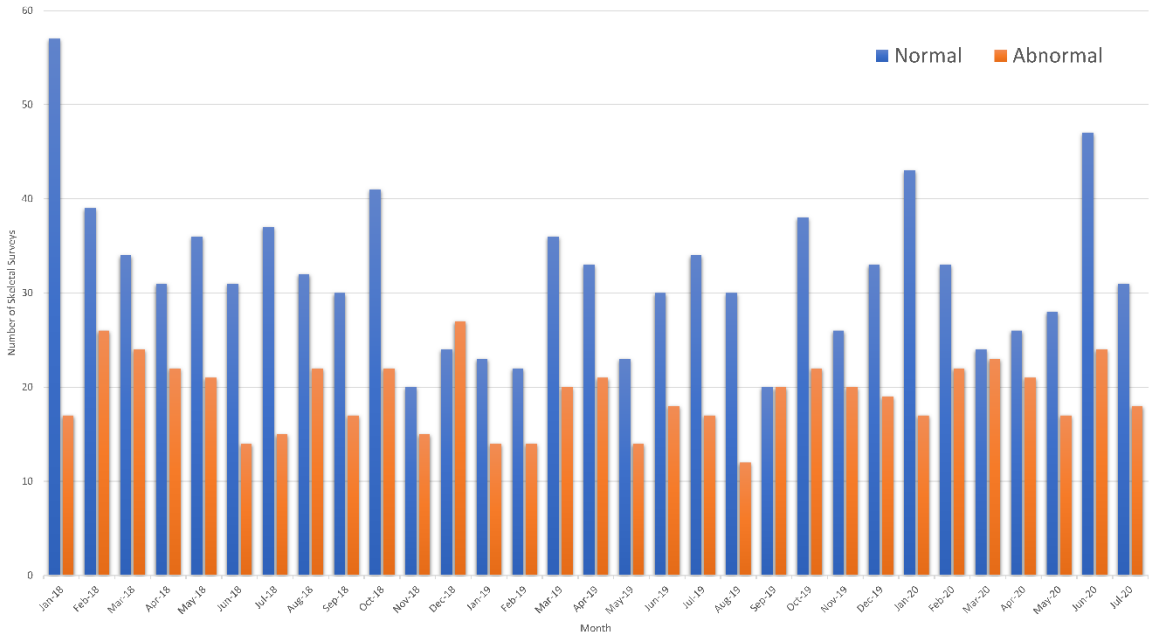

Fig 1. Direct comparison of absolute numbers of normal versus abnormal pre- and post-mortem skeletal surveys.

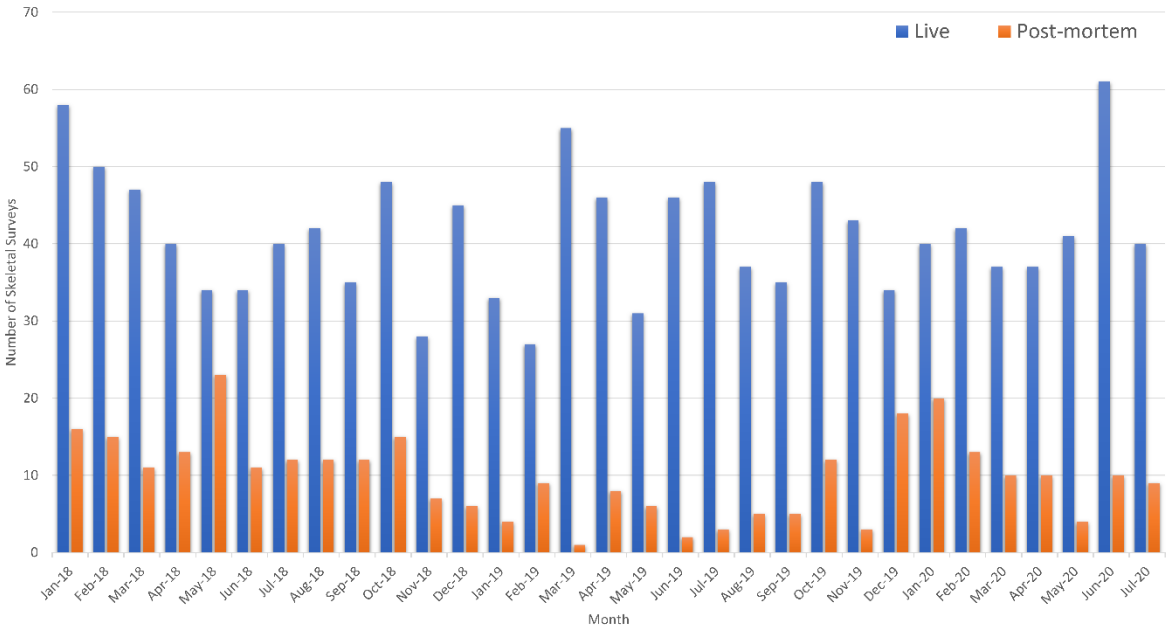

Fig 2. Comparison of absolute numbers of live versus post-mortem skeletal surveys undertaken from January 2018 to July 2020 inclusive.

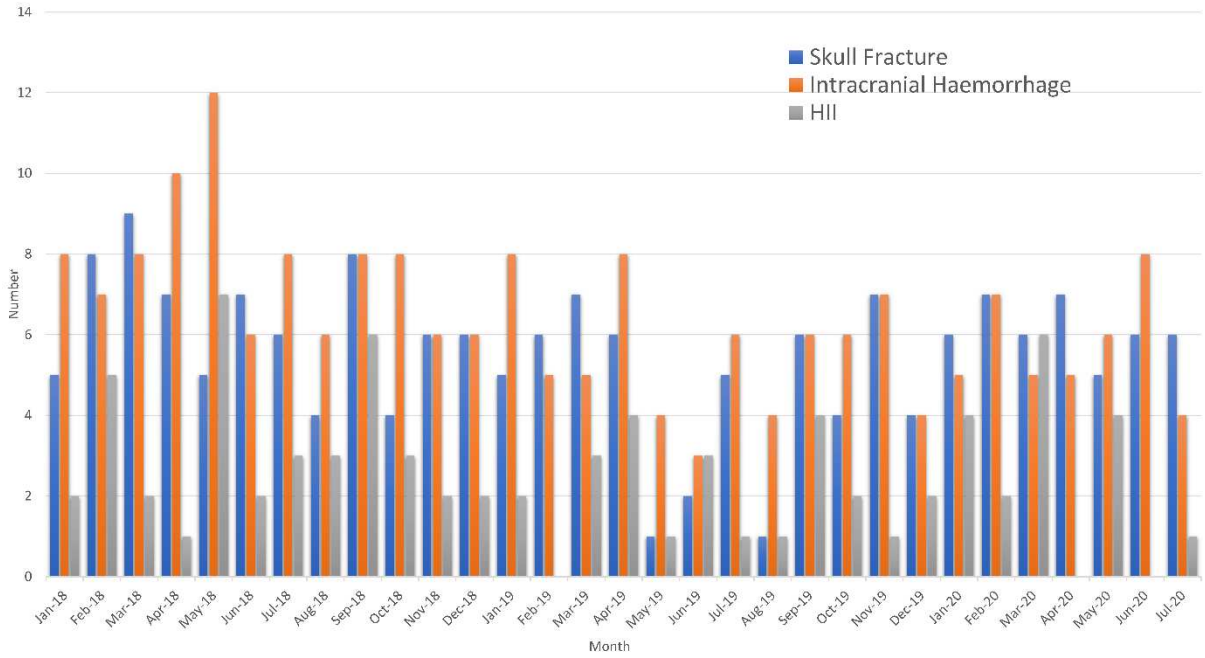

Fig 3. Comparison of absolute numbers of skull fractures, intracranial haemorrhage and hypoxic ischaemic injury from January 2018 through to July 2020 inclusive

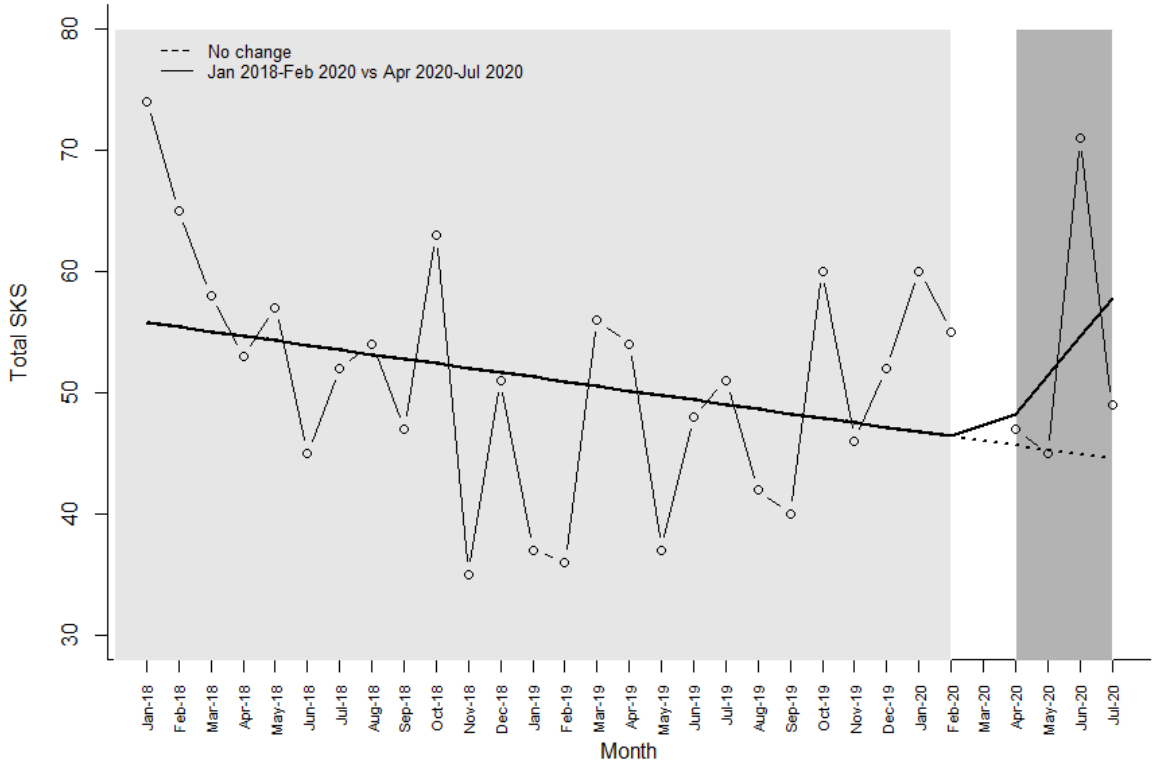

Fig 4. Timeseries demonstrating total number of skeletal surveys over time with segmented trend pre- and post-lockdown implementation.

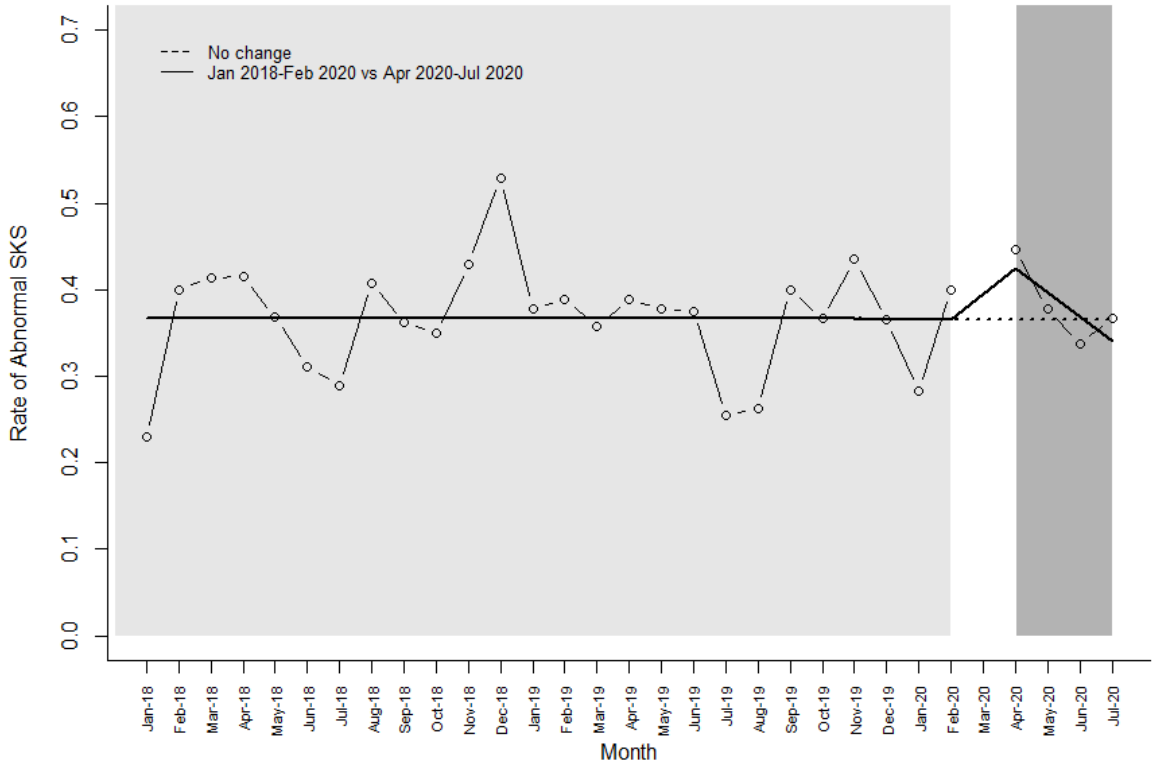

Fig 5. Timeseries demonstrating rate of abnormal skeletal surveys over time with segmented trend both pre- and post-lockdown implementation.

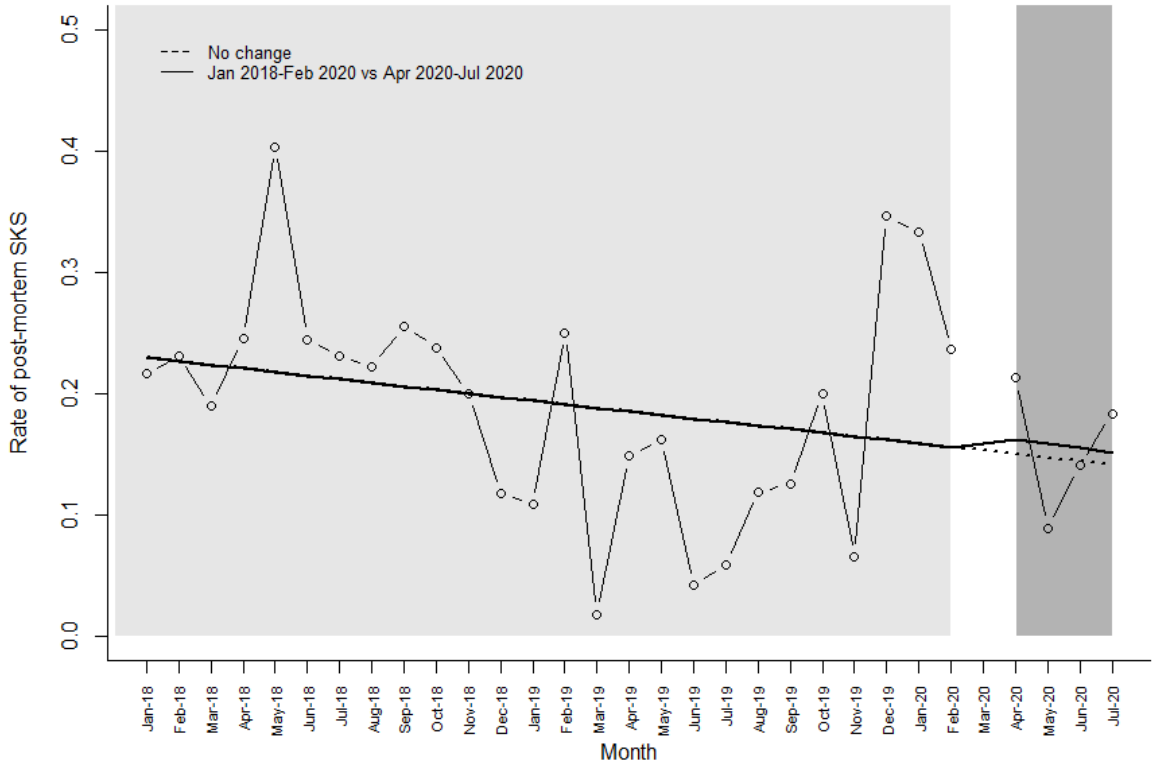

Fig 6. Timeseries demonstrating rate of post-mortem SkS imaging over time with segmented trend both pre and post lockdown implementation.

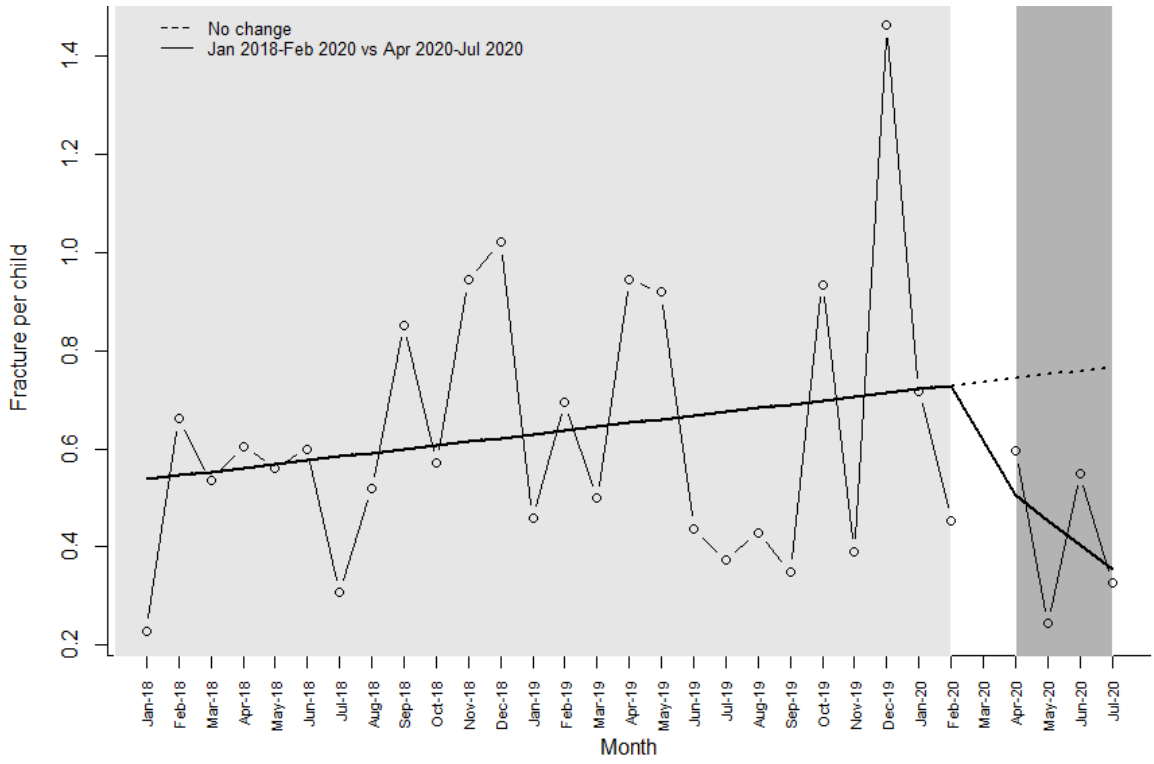

Fig 7. Timeseries demonstrating the rate of fracture per child over time with segmented trend both pre- and post-lockdown implementation.

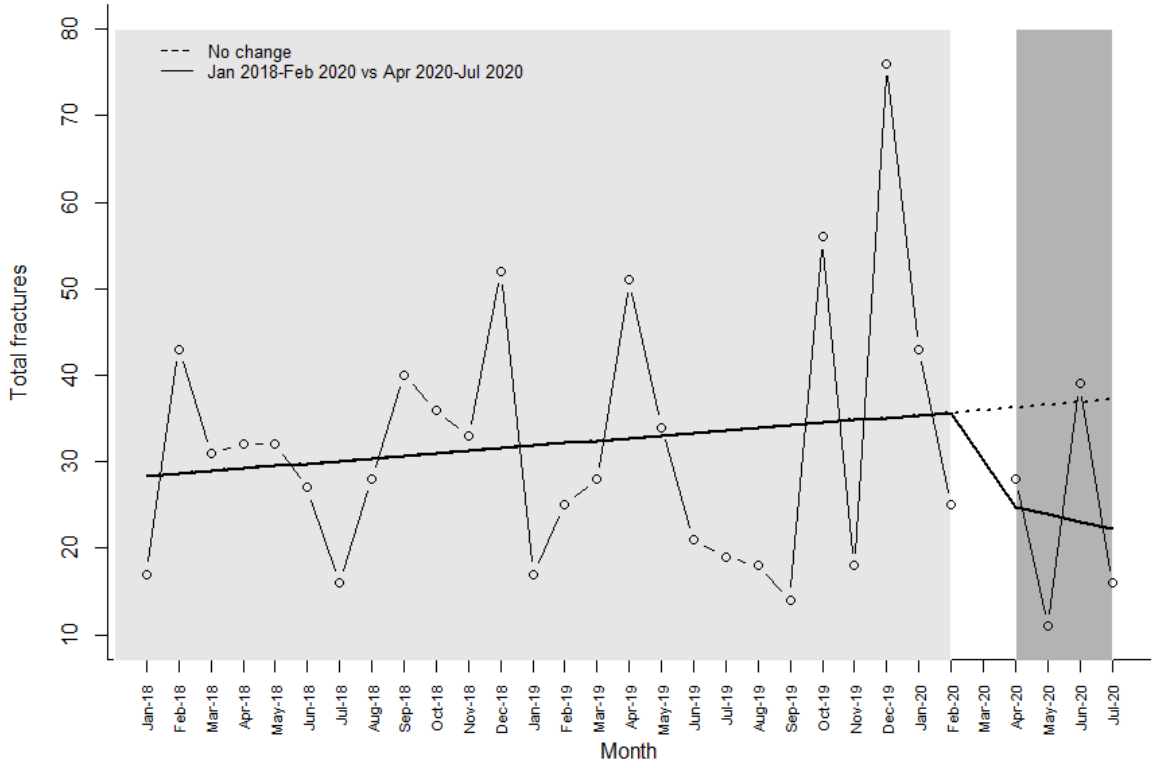

Fig 8. Timeseries demonstrating the total number of fractures identified over time with segmented trend both pre- and post-lockdown implementation.