BMJ Paediatrics Open

Cross-sectional study of paediatric case-mix presenting to an emergency centre during COVID-19

Journal:	*BMJ Paediatrics Open*
Manuscript ID	bmjpo-2020-000801
Article Type:	Original research
Date Submitted by the Author:	14-Jul-2020
Complete List of Authors:	Akuaake, Lembi; Stellenbosch University Faculty of Medicine and Health Sciences, Division of Emergency Medicine Hendrikse, Clint; University of Cape Town, Division of Emergency Medicine; Mitchells Plain Hospital and Heideveld Hospital, Emergency Centre Spittal, Graeme; Mitchells Plain Hospital, Paediatric Department Evans, Katya; Mitchells Plain Hospital and Heideveld Hospital, Emergency Centre; University of Cape Town, Division of Emergency Medicine van Hoving, Daniël; Stellenbosch University Faculty of Medicine and Health Sciences, Division of Emergency Medicine
Keywords:	Epidemiology, Health services research

I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our licence.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which Creative Commons licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

Cross-sectional study of paediatric case-mix presenting to an emergency centre during COVID-19

[1]Lembi Magano Akuaake, [2,3]Clint Hendrikse, [4]Graeme Spittal, [2,3]Katya Evans, [1]Daniël Jacobus van Hoving

[1]Division of Emergency Medicine, Stellenbosch University, Cape Town, South Africa

[2]Mitchells Plain Hospital and Heideveld Hospital Emergency Centres, Cape Town, South Africa

[3]Division of Emergency Medicine, University of Cape Town, Cape Town, South Africa

[4]Paediatric Department, Mitchells Plain Hospital, Cape Town, South Africa

Corresponding author: Daniël J. van Hoving

Division of Emergency Medicine, Stellenbosch University

PO Box 241

Cape Town, 8000

nvhoving@sun.ac.za

Number of tables: 4

Number of figures: 1

Word count: 2318

ABSTRACT

Objective

To describe and compare the effect of level 5 lockdown measures on the workload and case mix of paediatric patients presenting to a district-level emergency centre in Cape Town, South Africa.

Methods

Paediatric patients (<13 years) presenting to Mitchells Plain Hospital were retrospectively analysed. The level 5 lockdown period (27/03/2020 – 30/04/2020) was compared to similar 5-week periods immediately before (21/02/2020 – 26/03/2020) and after the lockdown (01/05/2020 – 04/06/2020), and to similar time periods during 2018 and 2019. Patient demographics, characteristics, ICD-10 code diagnoses, disposition and process times were collected from an electronic patient tracking and registration database. The Chi-square test and the independent samples median test were used for comparisons.

Results

Emergency centre visits during the lockdown period (n=592) decreased by 58% compared to 2019 (n=1413) and by 56% compared to the 2020 pre-lockdown period (n=1342). The proportion of under 1 year olds increased by 10.4% (p<0.001), with a 7.4% increase in self-referrals (p<0.001) and a 6.9% reduction in referrals from clinics (p<0.001). Proportionally more children were referred to inpatient disciplines (5.6%, p=0.001) and to a higher level of care (3.9%, p=0.004). Significant reductions occurred in respiratory diseases (66.9%, p<0.001), injuries (36.1%, p<0.001), and infectious diseases (34.1%, p<0.001). All process times were significantly different between the various study periods.

Conclusion

Significantly less children presented to the emergency centre since the implementation of the COVID-19 lockdown, with marked reductions in respiratory and infectious-related diseases and in injuries.

KEYWORDS

COVID-19, emergency centre, case mix, paediatric

INTRODUCTION

Paediatric emergency care decreases childhood morbidity and mortality, but an epidemic has the potential to disrupt access to care and essential child health services.[1–3]

The corona virus disease (COVID-19) was declared a global pandemic by the World Health Organization (WHO) on 11 March 2020 and is caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).[4] The pandemic resulted in most countries implementing social distancing measures to curb the spread of the disease. The South African government implemented a national lockdown on 27 March 2020, consisting of five levels with stricter social distancing measures as levels increase.[5] The South African lockdown started at level 5 and lasted five weeks (27 March – 30 April 2020). This was followed by easing of social distancing measures during level 4 (1 May – 31 May 2020) and level 3 which started on 1 June 2020.

The implemented lockdown measures resulted in all non-urgent healthcare appointments being cancelled, including the de-escalation of services at community healthcare centres and the rescheduling of elective surgeries and outpatient department visits at hospital level. An upsurge in patients visiting the emergency centre was anticipated as most other healthcare services were de-escalated. Furthermore, the pandemic and subsequent lockdown periods coincided with autumn and the beginning of winter where an increase in respiratory-related cases are typically experienced, especially in the paediatric population.

Previous studies presented conflicting results of health care utilisation during an epidemic. An increase in paediatric patients presenting to emergency centres was seen during the swine flu (H1N1pdm09 virus) pandemic in 2009.[6–8] However, paediatric-related presentations decreased by up to 40% during the 2015 Middle East respiratory syndrome (MERS) epidemic in Korea.[9,10] A more pronounced decrease (80%) was witnessed during the 2003 Severe Acute Respiratory Syndrome (SARS) epidemic in Taiwan.[11] A decline in trauma cases presenting to emergency centres across South Africa has already been noticed,[12] but the effect of the national lockdown on paediatric presentations remains unclear. The aim of the study was to describe and compare the effect of the level 5 national COVID-19 lockdown measures on the workload and case mix of paediatric patients presenting to a district-level emergency centre in Cape Town, South Africa.

METHODS

Study design

A retrospective analysis of a prospectively collected observational database was conducted.

Study setting

Mitchells Plain Hospital is a 300-bed hospital providing district hospital health services to the surrounding community. It serves a low- to middle-income health district of approximately 600 000

people.[13,14] The health district has many social challenges, including gangsterism, crime, and drug abuse. Interpersonal violence and other injuries are particularly prevalent during weekends.[15] Mitchells Plain Hospital is situated on the outskirts of Cape Town and has an emergency centre which manages around 4 100 patients per month; 950 being children under the age of 13 years. A quarter of the children are deemed very urgent or emergent at presentation (orange or red according to the South African Triage Scale)[16] and an average of 135 are admitted to the inpatient paediatric service. Monthly paediatric presentations increase to around 1 200 during the annual respiratory surge season (March – June), of which about 190 are admitted. Normally, the paediatric department assist with providing staff for the emergency centre and non-specialist physicians from the paediatric department have been the treating clinician for around 40% of acute paediatric presentations. Since the lockdown measures came in to effect, the paediatric department has been responsible for over 90% of acute paediatric presentations to free up emergency centre staff to assist with the adult workload. This was made possible by closing the paediatric out patient department and reverting to telephonic consultations that needed less staff.

An electronic patient tracking and registration database (HECTIS - Hospital and Emergency Centre Tracking Information System) is used to collect routine clinical data for each patient that is managed within the emergency centre. The tracking system was initially designed to track patients through the emergency centre. This allowed the streamlining of most patient processes and subsequently has been used to capture data related to process times, triage scores, ICD-10 code diagnoses and dispositions. The database has been built on an Oracle platform and is stored off-site. Data are automatically backed up everyday. The database is access controlled and authorised users are granted access and authorisation according to their specific clinical role. A triage nurse will thus have access to different parts of the database than a clinician in the emergency centre.

Study participants

Convenience sampling was used to include all patients <13 years of age that presented to the emergency centre of Mitchells Plain Hospital over the study periods. Time periods included the level 5 lockdown period (27 March 2020 till 30 April 2020), a 5-week period immediately before the lockdown (21 February 2020 – 26 March 2020), a 5-week period immediately after the lockdown (01 May 2020 – 04 June 2020) and corresponding periods during 2018 and 2019.

Data collection and management

Data were exported from the HECTIS database for the various study periods. Variables included age, gender, mode of transport, type of presentation, patient acuity, ICD-10 code diagnosis, process times, and disposition. Patient acuity was determined at arrival to the hospital and patients were categorised into emergency (red), very urgent (orange), urgent (yellow), and non-urgent (green) as stipulated by the South African Triage Scale (SATS).[16] Patients' diagnosis was determined from ICD-10 codes (International Statistical Classification of Diseases and Related Health Problems, 10th revision)

documented as the main diagnosis. Patient process times were calculated from electronic timestamps and included time to triage (arrival at emergency centre to time of triage), time to consultation (arrival at emergency centre to time seen by physician), time to disposition (arrival at emergency centre to time when emergency centre disposition was decided) and time in emergency centre (arrival at emergency centre to time when patient left the emergency centre). Process times of patients that absconded were only included to calculate the time to triage (if a triage time was documented) and were excluded from the other process times.

Statistical analysis

Summary statistics were used to describe all variables. Categorical data are summarised using frequency counts and percentages, and distributions of variables are presented as two-way tables or bar charts. Median was used as the measure of central tendency for continuous responses and quartiles as indicators of spread. The relationship between categorical variables was determined with the Chi-square test or the Fisher's Exact test, and process times were compared with the independent samples median test. A 5% significance level was used and data were analysed using SPSS Statistics for Windows, Version 26.0 (IBM Corp. Released 2019. Armonk, NY: IBM Corp.).

Patient and Public Involvement Statement

This research was done without patient involvement. Patients were not invited to comment on the study design and were not consulted to develop patient relevant outcomes or interpret the results. Patients were not invited to contribute to the writing or editing of this document for readability or accuracy.

RESULTS

Overall emergency centre visits

A total of 39 905 emergency centre visits were documented over the study periods, of which 9 983 were younger than 13 years of age. One patient was excluded as the visit only pertained to special investigations; 9 982 were thus analysed. There were 2 464 paediatric emergency centre visits during the 2020 time periods, 1 601 less than in 2019 (n=4065) and 989 less than in 2018 (n=3453). There was a 6.2% (n=78) increase in the number of patients seen during the 2020 pre-lockdown period compared to 2019, followed by a 58.1 % (n=821) reduction for the level 5 lockdown periods and a 61.8% (n=858) reduction over the post-lockdown periods (Figure 1).

Demographics and characteristics

The demographics and characteristics of patients are presented in Table 1. Significant differences during level 5 lockdown compared to the 2020 pre-lockdown period were seen in patient's age, where patients were coming from, patient acuity and disposition. The proportion of children younger than 1 year increased by 10.4% ($p<0.001$), with a decrease in the 1 to 5 year group (5.6%, $p=0.022$) and in patients

over the age of 5 years (4.8%, p=0.02). The proportions in the age category changed as lockdown measures were eased; children over 5 years were the only group showing an increase (7.1%, p=0.005). An increase in self referrals occurred (7.4%, p<0.001), with a subsequent decrease in referrals from primary healthcare clinics (6.9%, p<0.001) and general practitioners (0.4%, p=0.754). Children presenting during the level 5 lockdown periods were also sicker with a 2% increase in emergency (triaged red) cases (p=0.018). The change in patient acuity was also evident in the change in patient disposition; a proportional increase occurred in patients being referred to the inpatient disciplines (5.6%, p=0.001) and patients referred for higher level of care (3.9%, p=0.004). This coincided with a decrease in patients being discharged home from the emergency centre (5.6%, p=0.019).

Table 1. Demographics and characteristics of paediatric patients presenting to the emergency centre during the level 5 COVID-19 lockdown period and corresponding 5-week periods immediately before and after the lockdown and for two previous years.

		2018			2019			2020		
Variables n (%)		**Pre-lockdown**	**Level 5 lockdown**	**Post-lockdown**	**Pre-lockdown**	**Level 5 lockdown**	**Post-lockdown**	**Pre-lockdown**	**Level 5 lockdown**	**Post-lockdown**
Age (year)	<1	210 (21.2%)	372 (31.4%)	368 (28.8%)	249 (19.7%)	351 (24.8%)	312 (22.5%)	243 (18.1%)	169 (28.5%)[a]	116 (21.9%)[b]
	1-5	528 (53.2%)	592 (50%)	677 (53%)	717 (56.7%)	766 (54.2%)	742 (53.5%)	787 (58.6%)	314 (53%)[a]	279 (52.6%)
	>5	254 (25.6%)	219 (18.5%)	233 (18.2%)	298 (23.6%)	296 (20.9%)	334 (24.1%)	312 (23.2%)	109 (18.4%)[a]	135 (25.5%)[b]
Gender	Female	436 (44%)	509 (43%)	588 (46%)	537 (42.5%)	609 (43.1%)	610 (43.9%)	565 (42.1%)	267 (45.1%)	251 (47.4%)
	Male	556 (56%)	674 (57%)	690 (54%)	727 (57.5%)	804 (56.9%)	778 (56.1%)	777 (57.9%)	325 (54.9%)	279 (52.6%)
Transport method	Self	785 (79.1%)	920 (77.8%)	1082 (84.7%)	1025 (81.1%)	1171 (82.9%)	1267 (91.3%)	1115 (83.1%)	489 (82.6%)	476 (89.8%)[b]
	Ambulance	130 (13.1%)	178 (15%)	193 (15.1%)	152 (12%)	133 (9.4%)	120 (8.6%)	145 (10.8%)	69 (11.7%)	52 (9.8%)
	Police or Fire service	2 (0.2%)	1 (0.1%)	1 (0.1%)	2 (0.2%)	4 (0.3%)	1 (0.1%)	0 (0%)	0 (0%)	0 (0%)
	Unknown	75 (7.6%)	84 (7.1%)	2 (0.2%)	85 (6.7%)	105 (7.4%)	0 (0%)	82 (6.1%)	34 (5.7%)	2 (0.4%)[b]
Arrival from	Scene / home	658 (66.3%)	835 (70.6%)	907 (71%)	931 (73.7%)	1069 (75.7%)	1067 (76.9%)	1000 (74.5%)	485 (81.9%)[a,c]	457 (86.2%)[d]
	Other healthcare facility	262 (26.4%)	266 (22.5%)	285 (22.3%)	250 (19.8%)	242 (17.1%)	220 (15.9%)	260 (19.4%)	74 (12.5%)[a,c]	52 (9.8%)[d]
	General Practitioner	72 (7.3%)	82 (6.9%)	86 (6.7%)	83 (6.6%)	99 (7%)	101 (7.3%)	81 (6%)	33 (5.6%)	21 (4%)[d]
	Unknown	0 (0%)	0 (0%)	0 (0%)	0 (0%)	3 (0.2%)	0 (0%)	1 (0.1%)	0 (0%)	0 (0%)
Triage category	Non-urgent (Green)	238 (24%)	202 (17.1%)	202 (15.8%)	311 (24.6%)	287 (20.3%)	241 (17.4%)	344 (25.6%)	142 (24%)	172 (32.5%)[b,d]
	Urgent (Yellow)	516 (52%)	622 (52.6%)	760 (59.5%)	639 (50.6%)	758 (53.6%)	733 (52.8%)	663 (49.4%)	300 (50.7%)	256 (48.3%)
	Very urgent (Orange)	181 (18.2%)	286 (24.2%)	255 (20%)	246 (19.5%)	294 (20.8%)	351 (25.3%)	267 (19.9%)	115 (19.4%)	78 (14.7%)[b,d]
	Emergency (Red)	33 (3.3%)	41 (3.5%)	35 (2.7%)	39 (3.1%)	40 (2.8%)	35 (2.5%)	30 (2.2%)	25 (4.2%)[a]	17 (3.2%)
	Unknown	24 (2.4%)	32 (2.7%)	26 (2%)	29 (2.3%)	34 (2.4%)	28 (2%)	38 (2.8%)	10 (1.7%)	7 (1.3%)
Disposition	Death	2 (0.2%)	0 (0%)	1 (0.1%)	1 (0.1%)	4 (0.3%)	3 (0.2%)	4 (0.3%)	4 (0.7%)	0 (0%)
	Referred to in-hospital disciplines	193 (19.5%)	251 (21.2%)	293 (22.9%)	210 (16.6%)	209 (14.8%)	159 (11.5%)	163 (12.1%)[e]	105 (17.7%)[a]	91 (17.2%)[d]
	Discharged	674 (67.9%)	770 (65.1%)	817 (63.9%)	862 (68.2%)	946 (66.9%)	983 (70.8%)	871 (64.9%)	351 (59.3%)[a,c]	346 (65.3%)[b,d]
	Absconded	28 (2.8%)	42 (3.6%)	58 (4.5%)	66 (5.2%)	99 (7%)	92 (6.6%)	160 (11.9%)[e]	33 (5.6%)[a]	13 (2.5%)[b,d]
	Transferred to higher level facility	58 (5.8%)	86 (7.3%)	62 (4.9%)	101 (8%)	90 (6.4%)	87 (6.3%)	92 (6.9%)	64 (10.8%)[a,c]	65 (12.3%)[d]
	Refer to other	37 (3.7%)	34 (2.9%)	47 (3.7%)	24 (1.9%)	65 (4.6%)	64 (4.6%)	52 (3.9%)[e]	35 (5.9%)	15 (2.8%)[b]

[a] Statistically significant difference (p<0.05) between pre-lockdown period 2020 and level 5 lockdown period 2020 (see supplementary table 1)

[b] Statistically significant difference (p<0.05) between level 5 lockdown period 2020 and post-lockdown period 2020 (see supplementary table 1)

[c] Statistically significant difference (p<0.05) between level 5 lockdown period 2019 and 2020 (see supplementary table 1)

[d] Statistically significant difference (p<0.05) between post-lockdown period 2019 and 2020 (see supplementary table 1)

[e] Statistically significant difference (p<0.05) between pre-lockdown period 2019 and 2020 (see supplementary table 1)

Pre-lockdown period: 21 February – 26 March; Lockdown period: 27 March – 30 April; Post-lockdown period: 01 May – 04 June

Diagnostic categories

The top three diagnostic categories during the level 5 lockdown were related to the respiratory system (n=141, 23.8%), injuries and poisonings (n=133, 22.5%), and infectious diseases (n=110, 18.6%). In the different age groups, infectious diseases were most frequent in the under 1 year group (n=52, 30.8%), respiratory-related diseases in the 1-5 year group (n=84, 26.8%), and injury-related presentations in the over 5 year group (n=46, 14.6%) (Table 2). The top five diagnostic categories per age group and per time period is presented in Supplementary table 2. Presentations during the level 5 lockdown decreased in all the diagnostic categories compared to the 2020 pre-lockdown period (Table 3). Significant reductions occurred in respiratory diseases (n=285, 66.9%, p<0.001), injuries (n=75, 36.1%, p<0.001), and infectious and parasitic diseases (n=57, 34.1%, p<0.001). Proportionally, diseases of the respiratory system decreased by 7.9%, infectious-related diseases increased by 6.2%, and injuries increased by 7.0% (Table 3) (see supplementary table 3 for the diagnostic categories for all the time periods).

Table 2. Top five diagnostic categories per age group presenting to the emergency centre during the level 5 COVID-19 lockdown period.

All			<1 year			1-5 year			> 5 year		
Rank	**ICD-10 Category**	**N (%)**	**Rank**	**ICD-10 Category**	**n (%)**	**Rank**	**ICD-10 Category**	**n (%)**	**Rank**	**ICD-10 Category**	**n (%)**
1	Respiratory system	141 (23.8)	1	Infectious diseases	52 (30.8)	1	Respiratory system	84 (26.8)	1	Injury and poisoning	46 (14.6)
2	Injury and poisoning	133 (22.5)	2	Respiratory system	43 (25.4)	2	Injury and poisoning	79 (25.2)	2	Respiratory system	14 (4.5)
3	Infectious diseases	110 (18.6)	3	Findings, not elsewhere classified	13 (7.7)	3	Infectious diseases	47 (15.0)	3	Infectious diseases	11 (3.5)
4	Nervous system	30 (5.1)	4	Skin and subcutaneous tissue	11 (6.5)	4	Nervous system	16 (5.1)	4	Nervous system	10 (3.2)
5	Skin and subcutaneous tissue	26 (4.4)	5	Injury and poisoning	8 (4.7)	5	Ear and mastoid process	14 (4.5)	5	Digestive system	5 (1.6)

ICD-10: International Statistical Classification of Diseases and Related Health Problems, 10th revision

Table 3. Actual and proportional differences of paediatric presentations to the emergency centre during the level 5 lockdown period, compared to similar time periods.

	2020 vs 2019									2020					
	Pre-lockdown			Level 5 lockdown			Post-lockdown			Pre-lockdown vs Level 5 lockdown			Level 5 lockdown vs Post-lockdown		
ICD-10 category	**Actual n (%)**	**Proportional**	**p**	**Actual n (%)**	**Proportional**	**p**	**Actual n (%)**	**Proportional**	**p**	**Actual n (%)**	**Proportional**	**p**	**Actual n (%)**	**Proportional**	**p**
I Certain infectious and parasitic diseases	-80 (-32.4)	-7.1%	***<0.001***	-118 (-51.8)	2.5%	0.191	-97 (-58.1)	1.2%	0.486	-57 (-34.1)	6.2%	***<0.001***	-40 (-36.4)	-5.4%	***0.015***
VI Diseases of the nervous system	-7 (-14.3)	-0.8%	0.337	-14 (-31.8)	2.0%	***0.038***	-23 (-59.0)	0.2%	0.878	-12 (-28.6)	2.0%	0.050	-14 (-46.7)	-2.1%	0.097
VIII Diseases of the ear and mastoid process	22 (51.2)	1.4%	0.076	-42 (-65.6)	-0.8%	0.469	-50 (-78.1)	-2.0%	0.053	-43 (-66.2)	-1.1%	0.287	-8 (-36.4)	-1.1%	0.316
X Diseases of the respiratory system	-16 (-3.6)	-3.3%	0.081	-411 (-74,5)	-15.3%	***<0.001***	-466 (-77.7)	-17.9%	***<0.001***	-285 (-66.9)	-7.9%	***<0.001***	-7 (-5.0)	1.5%	0.579
XI Diseases of the digestive system	2 (7.7)	0.0%	1.000	-18 (-62.1)	-0.2%	0.862	1 (4.3)	2.8%	0.000	-17 (-60.7)	-0.2%	0.861	13 (118.2)	2.6%	0.015
XII Diseases of the skin and subcutaneous tissue	1 (2.1)	-0.1%	0.819	-20 (-43.5)	1.1%	0.236	-12 (-33.3)	1.9%	***0.039***	-23 (-46.9)	0.7%	0.445	-2 (-7.7)	0.1%	1.000
XIV Diseases of the genitourinary system	22 (122.2)	1.6%	***0.008***	-13 (-48.5)	0.5%	0.604	-10 (-45.5)	0.7%	0.334	-26 (-65.0)	-0.6%	0.462	-2 (-14.3)	-0.1%	1.000
XVIII Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	38 (74.5)	2.6%	***0.004***	-45 (-64.3)	-0.8%	0.493	-42 (-57.5)	0.5%	0.652	-64 (-71.9)	-2.4%	***0.046***	6 (24.0)	1.6%	0.220
XIX Injury, poisoning and certain other consequences of external causes	-1 (-0.5)	-1.0%	0.487	-12 (-8.3)	12.2%	***<0.001***	-21 (-12.1)	16.4%	***<0.001***	-75 (-36.1)	7.0%	***<0.001***	20 (15.0)	6.4%	***0.016***

Pre-lockdown period: 21 February – 26 March; Lockdown period: 27 March – 30 April; Post-lockdown period: 01 May – 04 June

Process times

All process times were significantly different between the various study periods (Table 4). Comparing median times between the level 5 lockdown period and the 2020 pre-lockdown period, time to triage decreased by 7 minutes (p<0.001), time to consultation by 91 minutes (p<0.001), time to deciding disposition by 76 minutes (p<0.001), and length of stay within the emergency centre by 41 minutes (p=0.003).

Table 4. Process times for paediatric patients (n=9308) presenting to the emergency centre during the 5-week COVID-19 level 5 lockdown period and corresponding periods for three years prior to the lockdown.

	2018			2019			2020			p
Process times (minutes), median(Q1-Q3) [maximum]	**Pre-lockdown**	**Level 5 lockdown**	**Post-lockdown**	**Pre-lockdown**	**Level 5 lockdown**	**Post-lockdown**	**Pre-lockdown**	**Level 5 lockdown**	**Post-lockdown**	
Time to triage	12 (5-31) [581]	15 (4-39) [803]	20 (7-47) [460]	19 (6-47) [612]	22 (7-52) [565]	16 (5-43) [368]	19 (6-49) [665]	12 (4-33) [308]	14 (5-34) [1461]	<0.001
Time to consultation	81 (45-132) [1067]	95 (54-159) [905]	104 (59-171) [1222]	107 (61-187) [654]	119 (66-214) [742]	118 (65-208) [685]	140 (71-235) [872]	49 (42-122) [590]	59 (29-101) [1054]	<0.001
Time to disposition decision	146 (94-216) [1437]	157 (99-242) [1146]	160 (106-246) [1291]	190 (121-295) [1521]	193 (121-314) [1506]	191 (112-291) [1026]	245 (156-365) [3337]	169 (95-267) [1918]	123 (70-204) [1773]	<0.001
Time in emergency centre	188 (126-278) [1438]	205 (129-320) [1797]	207 (130-330) [3800]	274 (165-495) [2043]	262 (146-428) [1717]	251 (142-411) [2632]	311 (200-492) [3353]	270 (153-459) [2349]	164 (85-423) [1984]	<0.001

Q1-Q3: 25th to 75th percentile
Pre-lockdown period: 21 February – 26 March; Lockdown period: 27 March – 30 April; Post-lockdown period: 01 May – 04 June

DISCUSSION

The volume of children visiting the emergency centre during and after the level 5 lockdown period was significantly lower than similar previous time periods. Significant reductions of total numbers were seen in respiratory diseases, infectious diseases and injuries (Table 3). Proportional reductions of diseases related to the respiratory system occurred in all age groups, while infectious diseases increased in younger patients (<1 year) and injuries increased in children older than one year.

The overall reduction in paediatric emergency centre visits is similar to experiences from the SARS and MERS pandemics, as people tend to avoid or delay attending hospitals due to the fear of contracting the communicable disease.[9–11] Anecdotal evidence do suggest that attendance to the primary healthcare services also decreased. This is of concern and child health needs to be monitored closely over the coming 12 months. The likely reduction in immunisations, specifically measles, could result in outbreaks of non-COVID-19 communicable diseases causing more morbidity and mortality.[3] The impact of this would be substantially worse in impoverished communities.

The reduction in respiratory and infectious-related diseases were substantial contributors to the overall reduction in emergency centre attendance, although the proportion of children with infectious diseases increased. These reductions are most likely multifactorial, and one important consideration could be the closing of early childhood development centres. It has been well documented that children attending crèches have a higher incidence of infectious diseases, including respiratory tract infections.[17,18] About three quarters of paediatric emergency centre attendees at Mitchells Plain Hospital are children under the age of 5 years, of whom a large proportion will normally be in formal or informal crèches while their parents work. The lockdown measures forced most parents to stay at home, thereby further reducing children's exposure to infections (COVID-19 and other) as trips to shops or work were limited.

Children presenting with injuries and poisoning decreased by a third during the level 5 lockdown period, but increased proportionally by 7% (Table 3). This was not expected and could be from children bypassing the community healthcare centres; thus children with minor injuries also presented to the hospital. On the other hand, the home is one of the most dangerous places for children. It is estimated that around 90% of unintentional injuries in young children occur in or around their home when they are supposedly being supervised by a caregiver.[19] Injury risk could also have increased if children became bored at home, while parents were most likely frustrated in the constant supervision of the children. Furthermore, anecdotal evidence suggest that the number of child abuse cases did not decrease during the lockdown periods and remain on a similar trend than before.[20] Another possible reason is the longstanding problem in South Africa where many children are looking after themselves and other children, with an understandable lack of adequate supervision.

The main strength of the study is the use of a comprehensive database that is completed in real time. Although data are not cross-checked, we expect the data to be adequately reflecting the truth. However, care should be taken to generalise the results of the study to other healthcare facilities as it reflects a single centre in a fairly distinctive setting. Diseases were categorised according to diagnostic codes (ICD-10) assigned by attending physicians. A diagnostic code was not assigned to around 10% of patients. We also did not validate whether the correct diagnosis were made, neither did we attempt to ensure that the correct diagnostic code were assigned to the diagnosis. This could have resulted in non-systematic error.

CONCLUSION

Significantly less children presented to the emergency centre since the implementation of national COVID-19 level 5 lockdown. The closure of early childhood development centres and schools, together with the restriction of movement of children and their caregivers, markedly reduced the infectious and respiratory-related component of paediatric attendees. The burden of injuries remains a huge problem in resource-limited societies, with the home being a high-risk area for unintentional injuries.

CONTRIBUTIONS

DJvH and CH conceived the study. MA, CH, and KE undertook data collection. MA and DJvH cleaned the data, and DJvH and CH did the data analyses. MA drafted the manuscript and the remaining authors critiqued the paper for important intellectual content. All authors read and approved the final version of the manuscript. MA is the guarantor.

FUNDING

The study was self-funded.

COMPETING INTERESTS

None declared.

ETHICS APPROVAL

The study was approved by the Health Research Ethics Committee of Stellenbosch University (Ref: N20/04/009_COVID-19) and included a waiver of informed consent.

FIGURE CAPTIONS

Figure 1. Number of paediatric emergency centre visits over a 5-week period before, during and after the COVID-19 level 5 lockdown.

WHAT IS ALREADY KNOWN ON THIS TOPIC

- The volume of children attending emergency centres varied during previous epidemics
- Paediatric emergency centre attendances decreased during COVID-19

WHAT THIS STUDY ADDS

- Younger and sicker children attended the emergency centre during the COVID-19 lockdown
- Marked reductions occurred in respiratory diseases, infectious-related diseases, and in injuries
- The proportion of infectious diseases increased in patients <1 year, while injuries increased in older children

REFERENCES

1 Krug SE, Bojko T, Dolan MA, *et al.* Access to Optimal Emergency Care for Children. *Pediatrics* 2007;**119**:161–4. doi:10.1542/peds.2006-2900

2 Quaglio G, Pizzol D, Bome D, *et al.* Maintaining Maternal and Child Health Services During the Ebola Outbreak: Experience from Pujehun, Sierra Leone. *PLoS Curr* 2016;**8**. doi:10.1371/currents.outbreaks.d67aea257f572201f835772d7f188ba5

3 World Health Organization. Vaccination In Acute Humanitarian Emergencies. Geneva: 2017. https://www.who.int/immunization/documents/who_ivb_17.03/en/ (accessed 20 Jun 2020).

4 World Health Organization. WHO Timeline - COVID-19. 2020.https://www.who.int/news-room/detail/27-04-2020-who-timeline---covid-19 (accessed 20 Jun 2020).

5 South African Government. President Cyril Ramaphosa: Extension of Coronavirus COVID-19 lockdown to the end of April. 2020.https://www.gov.za/speeches/president-cyril-ramaphosa-extension-coronavirus-covid-19-lockdown-end-april-9-apr-2020-0000 (accessed 2 Jun 2020).

6 Torres JP, O'Ryan M, Herve B, *et al.* Impact of the novel influenza A (H1N1) during the 2009 autumn-winter season in a large hospital setting in Santiago, Chile. *Clin Infect Dis* 2010;**50**:860–8. doi:10.1086/650750

7 Kwan-Gett TS, Baer A, Duchin JS. Spring 2009 H1N1 influenza outbreak in King Country Washington. *Disaster Med Public Health Prep* 2009;**3**. doi:10.1097/DMP.0b013e3181c6b818

8 Falconer E, Keddy M, Milne WK. Impact of the H1N1 influenza pandemic in two rural emergency departments. 2012;**12**. doi:10.22605/RRH2063

9 Lee SY, Khang YH, Lim HK. Impact of the 2015 middle east respiratory syndrome outbreak on emergency care utilization and mortality in South Korea. *Yonsei Med J* 2019;**60**:796–803. doi:10.3349/ymj.2019.60.8.796

10 Paek SH, Kim DK, Lee JH, *et al.* The impact of middle east respiratory syndrome outbreak on trends in emergency department utilization patterns. *J Korean Med Sci* 2017;**32**:1576–80. doi:10.3346/jkms.2017.32.10.1576

11 Huang H-H, Yen DH-T, Kao W-F, *et al.* Declining emergency department visits and costs during the severe acute respiratory syndrome (SARS) outbreak. *J Formos Med Assoc* 2006;**105**:31–7. doi:10.1016/S0929-6646(09)60106-6

12 Morris D, Rogers M, Kissmer N, *et al.* Impact of lockdown measures implemented during the Covid-19 pandemic on the burden of trauma presentations to a regional emergency department in Kwa-Zulu Natal, South Africa. *African J Emerg Med* Published Online First: 16 June 2020. doi:10.1016/j.afjem.2020.06.005

13 Statistics South Africa. Mitchells Plain. http://www.statssa.gov.za/?page_id=4286&id=329.

(accessed 17 Apr 2020).

14 Statistics South Africa. Philippi. http://www.statssa.gov.za/?page_id=4286&id=323 (accessed 17 Apr 2020).

15 Mitchell's Plain Nodal Economic Development Profile Western Cape. https://mitchellsplain.files.wordpress.com/2011/07/mitchells_20plain_20narrative.pdf

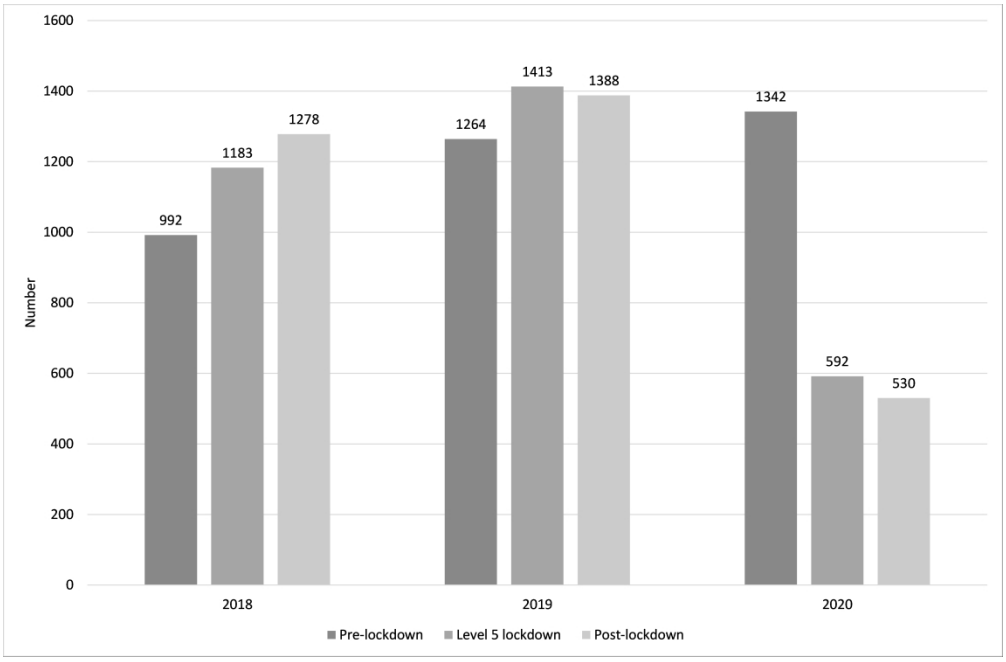
16 South African Triage Group. The South African Triage Scale (SATS). 2012.https://emssa.org.za/special-interest-groups/the-south-african-triage-scale-sats/ (accessed 28 Aug 2019).

17 Kamper-Jørgensen M, Wohlfahrt J, Simonsen J, *et al.* Population-based study of the impact of childcare attendance on hospitalizations for acute respiratory infections. *Pediatrics* 2006;**118**:1439–46. doi:10.1542/peds.2006-0373

18 Lu N, Samuels ME, Shi L, *et al.* Child day care risks of common infectious diseases revisited. *Child Care Health Dev* 2004;**30**:361–8. doi:10.1111/j.1365-2214.2004.00411.x

19 World Health Organization. World report on child injury prevention. Geneva: : World Health Organization 2015. https://www.who.int/violence_injury_prevention/child/injury/world_report/en/ (accessed 22 Jun 2020).

20 Cleary K. Fear, sadness and anger: The hidden impact of lockdown on children. City Press. 2020.https://www.news24.com/citypress/News/fear-sadness-and-anger-the-hidden-impact-of-lockdown-on-children-20200527 (accessed 23 Jun 2020).



258x168mm (500 x 500 DPI)

Supplementary table 1. Differences between different study periods of demographic and clinical characteristics of paediatric patients presenting to the emergency centre

	2020 vs 2019						2020			
	Pre-lockdown		Level 5 lockdown		Post-lockdown		Pre-lockdown vs Level 5 lockdown		Level 5 lockdown vs Post-lockdown	
Variables n (%)	**n (%)**	**p**	**n (%)**	**p**	**n (%)**	**p**	**n (%)**	**p**	**n (%)**	**p**
Age (year)										
<1	-6 (-2.4)	0.317	-182 (-51.9)	0.094	-196 (-62.8)	0.806	-74 (-30.5)	<0.001	-53 (-31.4)	0.011
1-5	70 (9.7)	0.322	-452 (-59.0)	0.659	-463 (-62.4)	0.759	-473 (-60.1)	0.022	-35 (-11.1)	0.905
>5	14 (4.)	0.853	-187 (-63.2)	0.201	-199 (-59.6)	0.553	-203 (-65.1)	0.020	26 (23.9)	0.005
Gender										
Female	28 (5.2)	0.874	-342 (-56.2)	0.430	-359 (-58.9)	0.182	-298 (-52.7)	0.232	-16 (-6.0)	0.472
Male	50 (6.9)	0.000	-479 (-59.6)		-499 (-64.1)	0.000	-452 (-58.2)	0.000	-46 (-14.2)	0.000
Transport method										
Self	90 (8.8)	0.201	-682 (-58.2)	0.897	-791 (-62.4)	0.330	-626 (-56.1)	0.844	-13 (-2.7)	0.001
Ambulance	-7 (-4.6)	0.355	-64 (-48.1)	0.143	-68 (-56.7)	0.475	-76 (-52.4)	0.637	-17 (-24.6)	0.336
Police or Fire service	-2 (-100)	0.235	-4 (-100)	0.326	-1 (-100)	1.000	0 (0)	---	0 (0)	---
Unknown	-3 (-3.5)	0.575	-71 (-67.6)	0.179	2 (200)	0.076	-48 (-58.5)	0.758	-32 (-94.1)	<0.001
Arrival from										
Scene / home	69 (7.4)	0.623	-584 (-54.6)	0.002	-610 (-57.2)	<0.001	-515 (-51.5)	<0.001	-28 (-5.8)	0.051
Other healthcare facility	10 (4)	0.805	-168 (-69.4)	0.011	-168 (-76.4)	0.001	-186 (-71.5)	<0.001	-22 (-29.7)	0.157
General Practitioner	-2 (-2.4)	0.628	-66 (-66.7)	0.277	-80 (-79.2)	0.009	-48 (-59.3)	0.754	-12 (-36.4)	0.213
Unknown	1 (100)	1.000	-3 (-100)	0.560	0 (0)	---	-1 (-100)	1.000	0 (0)	---
Triage category										
Non-urgent (Green)	33 (10.6)	0.557	-145 (-50.5)	0.073	-69 (-28.6)	<0.001	-202 (-58.2)	0.460	-30 (-14.2)	0.002
Urgent (Yellow)	24 (3.7)	0.292	-458 (-60.4)	0.239	-477 (-65.1)	0.082	-363 (-58.7)	0.622	-44 (-21.1)	0.437
Very urgent (Orange)	21 (8.5)	0.805	-179 (-60.9)	0.504	-273 (-77.8)	<0.001	-152 (-54.8)	0.853	-37 (-14.7)	0.039
Emergency (Red)	-9 (-23.1)	0.182	-15 (-37.5)	0.128	-18 (-51.4)	0.432	-5 (-56.9)	0.018	-8 (-32.2)	0.432
Unknown	9 (31.0)	0.458	-24 (-70.6)	0.404	-21 (-75)	0.347	-28 (-73.7)	0.155	-3 (-30)	0.636
Disposition										
Referred to in-hospital disciplines	3 (300)	0.376	0 (0)	0.246	-3 (-100)	0.565	0 (0)	0.258	-4 (-100)	0.127
Discharged	-47 (-22.4)	0.001	-104 (-49.8)	0.106	-68 (-42.8)	0.001	-58 (-35.6)	0.001	-14 (-13.3)	0.814
Absconded	9 (1.0)	0.081	-595 (-62.9)	0.001	-637 (-64.8)	0.020	-520 (-59.7)	0.019	-5 (-1.4)	0.042
Transferred to higher level facility	94 (142.4)	0.001	-66 (-66.7)	0.277	-79 (-85.9)	0.001	-127 (-79.4)	0.001	-20 (-60.6)	0.010
Refer to other	-9 (-8.9)	0.295	-26 (-28.9)	0.001	-22 (-25.3)	<0.001	-28 (-30.4)	0.004	1 (1.6)	0.455
Referred to in-hospital disciplines	28 (116.7)	0.003	-30 (-46. 2)	0.260	-49 (-76.6)	0.094	-17 (-32.7)	0.056	-20 (-57.1)	0.014

Pre-lockdown period: 21 February – 26 March; Lockdown period: 27 March – 30 April; Post-lockdown period: 01 May – 04 June

Supplementary table 2. Top five diagnostic categories per age group presenting to the emergency centre during the level 5 COVID-19 lockdown period and similar time periods.

2019 Lockdown		2020 Pre-lockdown		2020 level 5 lockdown		2020 Post-lockdown	
ICD-10 Category	**n (%)**	**ICD-10 Category**	**n (%)**	**ICD-10 Category**	**n (%)**	**ICD-10 Category**	**n (%)**
All							
Respiratory system	442 (35.0)	Respiratory system	426 (31.7)	Respiratory system	141 (23.8)	Injury and poisoning	153 (28.9)
Infectious diseases	247 (19.5)	Injury and poisoning	208 (15.5)	Injury and poisoning	133 (22.5)	Respiratory system	134 (25.3)
Injury and poisoning	209 (16.5)	Infectious diseases	167 (12.4)	Infectious diseases	110 (18.6)	Infectious diseases	70 (13.2)
Findings, not elsewhere classified	51 (4.0)	Findings, not elsewhere classified	89 (6.6)	Nervous system	30 (5.1)	Findings, not elsewhere classified	31 (5.8)
Nervous system	49 (3.9)	Ear and mastoid process	65 (4.8)	Skin and subcutaneous tissue	26 (4.4)	Digestive system	24 (4.5)
						Skin and subcutaneous tissue	24 (4.5)
<1 year							
Respiratory system	200 (57.0)	Respiratory system	78 (32.1)	Infectious diseases	52 (30.8)	Infectious diseases	33 (28.4)
Infectious diseases	65 (18.5)	Infectious diseases	61 (25.1)	Respiratory system	43 (25.4)	Respiratory system	29 (25.0)
Findings, not elsewhere classified	11 (3.1)	Findings, not elsewhere classified	20 (8.2)	Findings, not elsewhere classified	13 (7.7)	Injury and poisoning	13 (11.2)
Injury and poisoning	10 (2.8)	Injury and poisoning	18 (7.4)	Skin and subcutaneous tissue	11 (6.5)	Skin and subcutaneous tissue	9 (7.8)
Skin and subcutaneous tissue	7 (2.0)	Skin and subcutaneous tissue	10 (4.1)	Injury and poisoning	8 (4.7)	Digestive system	6 (5.2)
Ear and mastoid process	7 (2.0)						
1-5 year							
Respiratory system	294 (38.4)	Respiratory system	284 (36.1)	Respiratory system	84 (26.8)	Injury and poisoning	93 (33.3)
Infectious diseases	125 (16.3)	Injury and poisoning	108 (13.7)	Injury and poisoning	79 (25.2)	Respiratory system	79 (28.3)
Injury and poisoning	78 (10.2)	Infectious diseases	91 (11.6)	Infectious diseases	47 (15.0)	Infectious diseases	23 (8.2)
Ear and mastoid process	50 (6.5)	Ear and mastoid process	51 (6.5)	Nervous system	16 (5.1)	Findings, not elsewhere classified	20 (7.2)
Findings, not elsewhere classified	32 (4.2)	Findings, not elsewhere classified	36 (4.6)	Ear and mastoid process	14 (4.5)	Ear and mastoid process	12 (4.3)
> 5 year							
Respiratory system	58 (7.6)	Injury and poisoning	82 (10.4)	Injury and poisoning	46 (14.6)	Injury and poisoning	47 (16.8)
Injury and poisoning	57 (7.4)	Respiratory system	64 (8.1)	Respiratory system	14 (4.5)	Respiratory system	26 (9.3)
Infectious diseases	38 (5.0)	Findings, not elsewhere classified	33 (4.2)	Infectious diseases	11 (3.5)	Infectious diseases	14 (5.0)
Findings, not elsewhere classified	27 (3.5)	Nervous system	19 (2.4)	Nervous system	10 (3.2)	Digestive system	12 (4.3)
Nervous system	24 (3.1)	Skin and subcutaneous tissue	16 (2.0)	Digestive system	5 (1.6)	Nervous system	7 (2.5)
		Genitourinary system	16 (2.0)				

ICD-10: International Statistical Classification of Diseases and Related Health Problems, 10th revision; Pre-lockdown period: 21 February – 26 March; Lockdown period: 27 March – 30 April; Post-lockdown period: 01 May – 04 June

Supplementary table 3. Diagnostic categories of paediatric patients presenting to the emergency centre during the level 5 COVID-19 lockdown period and corresponding time periods.

	2018			2019			2020		
ICD-10 Category, n(%)	**Pre-lockdown**	**Level 5 lockdown**	**Post-lockdown**	**Pre-lockdown**	**Level 5 lockdown**	**Post-lockdown**	**Pre-lockdown**	**Level 5 lockdown**	**Post-lockdown**
I Certain infectious and parasitic diseases	220 (22.2%)	207 (17.5%)	225 (17.6%)	247 (19.5%)	228 (16.1%)	167 (12%)	167 (12.4%)	110 (18.6%)	70 (13.2%)
II Neoplasms	1 (0.1%)	2 (0.2%)	0 (0%)	0 (0%)	3 (0.2%)	2 (0.1%)	0 (0%)	0 (0%)	0 (0%)
III Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	0 (0%)	0 (0%)	1 (0.1%)	2 (0.2%)	1 (0.1%)	0 (0%)	1 (0.1%)	1 (0.2%)	3 (0.6%)
IV Endocrine, nutritional and metabolic diseases	1 (0.1%)	1 (0.1%)	7 (0.5%)	8 (0.6%)	7 (0.5%)	8 (0.6%)	2 (0.1%)	1 (0.2%)	2 (0.4%)
V Mental and behavioural disorders	1 (0.1%)	3 (0.3%)	3 (0.2%)	2 (0.2%)	0 (0%)	6 (0.4%)	0 (0%)	2 (0.3%)	0 (0%)
VI Diseases of the nervous system	21 (2.1%)	16 (1.4%)	24 (1.9%)	49 (3.9%)	44 (3.1%)	39 (2.8%)	42 (3.1%)	30 (5.1%)	16 (3%)
VII Diseases of the eye and adnexa	6 (0.6%)	4 (0.3%)	8 (0.6%)	10 (0.8%)	11 (0.8%)	14 (1%)	9 (0.7%)	2 (0.3%)	1 (0.2%)
VIII Diseases of the ear and mastoid process	25 (2.5%)	45 (3.8%)	66 (5.2%)	43 (3.4%)	64 (4.5%)	64 (4.6%)	65 (4.8%)	22 (3.7%)	14 (2.6%)
IX Diseases of the circulatory system	0 (0%)	0 (0%)	2 (0.2%)	3 (0.2%)	6 (0.4%)	2 (0.1%)	1 (0.1%)	1 (0.2%)	0 (0%)
X Diseases of the respiratory system	308 (31%)	500 (42.3%)	512 (40.1%)	442 (35%)	552 (39.1%)	600 (43.2%)	426 (31.7%)	141 (23.8%)	134 (25.3%)
XI Diseases of the digestive system	34 (3.4%)	30 (2.5%)	27 (2.1%)	26 (2.1%)	29 (2.1%)	23 (1.7%)	28 (2.1%)	11 (1.9%)	24 (4.5%)
XII Diseases of the skin and subcutaneous tissue	82 (8.3%)	59 (5%)	50 (3.9%)	48 (3.8%)	46 (3.3%)	36 (2.6%)	49 (3.7%)	26 (4.4%)	24 (4.5%)
XII Diseases of the musculoskeletal system and connective tissue	1 (0.1%)	6 (0.5%)	3 (0.2%)	8 (0.6%)	17 (1.2%)	8 (0.6%)	2 (0.1%)	2 (0.3%)	7 (1.3%)
XIV Diseases of the genitourinary system	33 (3.3%)	20 (1.7%)	25 (2%)	18 (1.4%)	27 (1.9%)	22 (1.6%)	40 (3%)	14 (2.4%)	12 (2.3%)
XV Pregnancy, childbirth and the puerperium	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (0.2%)
XVI Certain conditions originating in the perinatal period	0 (0%)	1 (0.1%)	3 (0.2%)	2 (0.2%)	2 (0.1%)	2 (0.1%)	2 (0.1%)	4 (0.7%)	3 (0.6%)
XVII Congenital malformations, deformations and chromosomal abnormalities	1 (0.1%)	0 (0%)	1 (0.1%)	1 (0.1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (0.4%)
XVIII Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	50 (5%)	64 (5.4%)	58 (4.5%)	51 (4%)	70 (5%)	73 (5.3%)	89 (6.6%)	25 (4.2%)	31 (5.8%)
XIX Injury, poisoning and certain other consequences of external causes	133 (13.4%)	119 (10.1%)	94 (7.4%)	209 (16.5%)	145 (10.3%)	174 (12.5%)	208 (15.5%)	133 (22.5%)	153 (28.9%)
XX External causes of morbidity and mortality	36 (3.6%)	41 (3.5%)	40 (3.1%)	6 (0.5%)	9 (0.6%)	8 (0.6%)	11 (0.8%)	4 (0.7%)	5 (0.9%)
XXI Factors influencing health status and contact with health services	6 (0.6%)	10 (0.8%)	14 (1.1%)	14 (1.1%)	9 (0.6%)	2 (0.1%)	15 (1.1%)	8 (1.4%)	7 (1.3%)
Unknown	33 (3.3%)	55 (4.6%)	115 (9%)	75 (5.9%)	143 (10.1%)	138 (9.9%)	185 (13.8%)	55 (9.3%)	21 (4%)

Pre-lockdown period: 21 February – 26 March; Lockdown period: 27 March – 30 April; Post-lockdown period: 01 May – 04 June

BMJ Paediatrics Open

Cross-sectional study of paediatric case mix presenting to an emergency centre in Cape Town, South Africa during COVID-19

Journal:	*BMJ Paediatrics Open*
Manuscript ID	bmjpo-2020-000801.R1
Article Type:	Original research
Date Submitted by the Author:	02-Sep-2020
Complete List of Authors:	Akuaake, Lembi; Stellenbosch University Faculty of Medicine and Health Sciences, Division of Emergency Medicine Hendrikse, Clint; University of Cape Town, Division of Emergency Medicine; Mitchells Plain Hospital and Heideveld Hospital, Emergency Centre Spittal, Graeme; Mitchells Plain Hospital, Paediatric Department Evans, Katya; Mitchells Plain Hospital and Heideveld Hospital, Emergency Centre; University of Cape Town, Division of Emergency Medicine van Hoving, Daniël; Stellenbosch University Faculty of Medicine and Health Sciences, Division of Emergency Medicine
Keywords:	Epidemiology, Health services research

I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our licence.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which Creative Commons licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

Cross-sectional study of paediatric case mix presenting to an emergency centre in Cape Town, South Africa during COVID-19

[1]Lembi Magano Akuaake, [2,3]Clint Hendrikse, [4]Graeme Spittal, [2,3]Katya Evans, [1]Daniël Jacobus van Hoving

[1]Division of Emergency Medicine, Stellenbosch University, Cape Town, South Africa

[2]Mitchells Plain Hospital and Heideveld Hospital Emergency Centres, Cape Town, South Africa

[3]Division of Emergency Medicine, University of Cape Town, Cape Town, South Africa

[4]Paediatric Department, Mitchells Plain Hospital, Cape Town, South Africa

Corresponding author: Daniël J. van Hoving

Division of Emergency Medicine, Stellenbosch University

PO Box 241

Cape Town, 8000

nvhoving@sun.ac.za

Number of tables: 4

Number of figures: 1

Word count: 2714

ABSTRACT

Objective

To describe and compare the effect of level 5 lockdown measures on the workload and case mix of paediatric patients presenting to a district-level emergency centre in Cape Town, South Africa.

Methods

Paediatric patients (<13 years) presenting to Mitchells Plain Hospital were included. The level 5 lockdown period (27/03/2020 – 30/04/2020) was compared to similar 5-week periods immediately before (21/02/2020 – 26/03/2020) and after the lockdown (01/05/2020 – 04/06/2020), and to similar time periods during 2018 and 2019. Patient demographics, characteristics, ICD-10 (International Statistical Classification of Diseases and Related Health Problems 10th Revision) diagnosis, disposition and process times were collected from an electronic patient tracking and registration database. The Chi-square test and the independent samples median test were used for comparisons.

Results

Emergency centre visits during the lockdown period (n=592) decreased by 58% compared to 2019 (n=1413) and by 56% compared to the 2020 pre-lockdown period (n=1342). The proportion of under 1 year olds increased by 10.4% (p<0.001), with a 7.4% increase in self-referrals (p<0.001) and a 6.9% reduction in referrals from clinics (p<0.001). Proportionally more children were referred to inpatient disciplines (5.6%, p=0.001) and to a higher level of care (3.9%, p=0.004). Significant reductions occurred in respiratory diseases (66.9%, p<0.001), injuries (36.1%, p<0.001), and infectious diseases (34.1%, p<0.001). All process times were significantly different between the various study periods.

Conclusion

Significantly less children presented to the emergency centre since the implementation of the COVID-19 lockdown, with marked reductions in respiratory and infectious-related diseases and in injuries.

KEYWORDS

COVID-19, emergency centre, case mix, paediatric

INTRODUCTION

Paediatric emergency care decreases childhood morbidity and mortality, but an epidemic has the potential to disrupt access to care and essential child health services.[1–3]

The corona virus disease (COVID-19) was declared a global pandemic by the World Health Organization (WHO) on 11 March 2020 and is caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).[4] The pandemic resulted in most countries implementing social distancing measures to curb the spread of the disease. The South African government implemented a national lockdown on 27 March 2020, consisting of five levels.[5] Level 5 is the most restrictive with only essential services permitted to operate and strict limitations on public transport services with regards to capacity and operating times. The sale of alcohol and tobacco is prohibited as well as any form of exercise in public spaces. Lower levels are a stepwise easing of the restrictions imposed on level 5 in varying degrees to attempt to limit community transmission and resurgence of the virus, while allowing for economic recovery. Level 1 allows for near normal activity to resume but with the recommended public health guidelines to be followed at all times, including wearing a facemask, maintaining social distancing of at least 2 meters and frequently washing or sanitising hands. The South African lockdown started at level 5, which lasted five weeks (27 March – 30 April 2020) and was followed by level 4 (1 May – 31 May 2020). Level 3 restrictions were implemented on 1 June 2020 and was still in place at the time of data collection.

The implemented lockdown measures under level 5 resulted in all non-urgent healthcare appointments being cancelled, including the de-escalation of services at community healthcare centres and the rescheduling of elective surgeries and outpatient department visits at hospital level. An upsurge in patients visiting the emergency centre was anticipated as most other healthcare services were de-escalated. Furthermore, the pandemic and subsequent lockdown periods coincided with autumn and the beginning of winter where an increase in respiratory-related cases are typically experienced, especially in the paediatric population. On the other hand, the effect of the closing of early childhood development centres and schools, as well as most parents forced to work from home, are unknown but could also change the number and type of presentations to the emergency centre.

Previous studies presented conflicting results of health care utilisation during an epidemic. An increase in paediatric patients presenting to emergency centres was seen during the swine flu (H1N1pdm09 virus) pandemic in 2009.[6–8] However, paediatric-related presentations decreased by up to 40% during the 2015 Middle East respiratory syndrome (MERS) epidemic in Korea.[9,10] A more pronounced decrease (80%) was witnessed during the 2003 Severe Acute Respiratory Syndrome (SARS) epidemic in Taiwan.[11] A decline in trauma cases presenting to emergency centres across South Africa has already been noticed,[12] but the effect of the national lockdown on paediatric presentations remains unclear. The aim of the study was to describe and compare the effect of the level 5 national COVID-19 lockdown measures on the workload and case mix of paediatric patients presenting to a district-level emergency centre in Cape Town, South Africa.

METHODS

Study design

A descriptive analysis was conducted on existing data. Data was extracted from an existing database that collects routine data prospectively (in real time).

Study setting

Mitchells Plain Hospital is a 365-bed hospital providing district hospital health services to the surrounding community. It serves a low- to middle-income health district of approximately 600 000 people.[13,14] The health district has many social challenges, including gangsterism, crime, and drug abuse. Interpersonal violence and other injuries are particularly prevalent during weekends.[15] Mitchells Plain Hospital is situated on the outskirts of Cape Town and has an emergency centre which manages around 4 100 patients per month; 950 being children under the age of 13 years. A quarter of the children are deemed very urgent or emergent at presentation (orange or red according to the South African Triage Scale)[16] and an average of 135 are admitted to the inpatient paediatric service. Monthly paediatric presentations increase to around 1 200 during the annual respiratory surge season (March – June), of which about 190 are admitted. Normally, the paediatric department assist with providing staff for the emergency centre and non-specialist physicians from the paediatric department have been the treating clinician for around 40% of acute paediatric presentations. Since the lockdown measures came in to effect, the paediatric department has been responsible for over 90% of acute paediatric presentations to free up emergency centre staff to assist with the adult workload. This was made possible by closing the paediatric out patient department and reverting to telephonic consultations that needed less staff.

An electronic patient tracking and registration database (HECTIS - Hospital and Emergency Centre Tracking Information System) is used to collect routine clinical data for each patient that is managed within the emergency centre.

HECTIS is an official electronic application of the Western Cape Department of Health which follows the flow of patients in an emergency centre from arrival to discharge or admission. It is used by numerous emergency centres to streamline patient processes and capture data related to process times, triage scores, ICD-10 (International Statistical Classification of Diseases and Related Health Problems 10th Revision) diagnoses and dispositions. The database has been built on an Oracle platform and is stored off-site. The database is access controlled and authorised users are granted access and authorisation according to their specific clinical role. A triage nurse will thus have access to different parts of the database than a clinician in the emergency centre.

Study participants

Convenience sampling was used to include all patients <13 years of age that presented to the emergency centre of Mitchells Plain Hospital over the study periods. Time periods included the level 5 lockdown period (27 March 2020 till 30 April 2020), a 5-week period immediately before the lockdown (21 February 2020 – 26 March 2020), a 5-week period immediately after the lockdown (01 May 2020 – 04 June 2020) and corresponding periods during 2018 and 2019.

Data collection and management

Data were exported from the HECTIS database for the various study periods. Variables included age, gender, mode of transport, type of presentation, triage category, ICD-10 diagnosis, process times, and disposition. The triage category was determined at arrival to the hospital and patients were categorised into emergency (red), very urgent (orange), urgent (yellow), and non-urgent (green) as stipulated by the South African Triage Scale (SATS).[16] Patients' diagnosis was determined from ICD-10 codes documented as the main diagnosis. Disposition refers to where a patient is being discharged from the emergency centre. Patient process times were calculated from electronic timestamps and included time to triage (arrival at emergency centre to time of triage), time to consultation (arrival at emergency centre to time seen by physician), time to disposition (arrival at emergency centre to time when emergency centre disposition was decided) and time in emergency centre (arrival at emergency centre to time when patient left the emergency centre). Process times of patients that absconded were only included to calculate the time to triage (if a triage time was documented) and were excluded from the other process times.

Statistical analysis

Summary statistics were used to describe all variables. Categorical data are summarised using frequency counts and percentages, and are presented as two-way tables or bar charts. Median was used as the measure of central tendency for continuous responses and quartiles as indicators of spread. The relationship between categorical variables was determined with the Chi-square test or the Fisher's Exact test, and process times were compared with the independent samples median test. A 5% significance level was used and data were analysed using SPSS Statistics for Windows, Version 26.0 (IBM Corp. Released 2019. Armonk, NY: IBM Corp.).

Patient and Public Involvement Statement

This research was done without patient involvement. Patients were not invited to comment on the study design and were not consulted to develop patient relevant outcomes or interpret the results. Patients were not invited to contribute to the writing or editing of this document for readability or accuracy.

RESULTS

Overall emergency centre visits

A total of 39 905 emergency centre visits were documented over the study periods, of which 9 983 were younger than 13 years of age (a 15% reduction in all (adult and paediatric) emergency centre visits compared to 2019 was observed, as well as a 35% reduction over the lockdown period).[17] One patient was excluded as the visit only pertained to special investigations; 9 982 were thus analysed. There were 2 464 paediatric emergency centre visits during the 2020 time periods, 1 601 less than in 2019 (n=4065) and 989 less than in 2018 (n=3453). There was a 6.2% (n=78) increase in the actual number of patients seen during the 2020 pre-lockdown period compared to 2019, followed by a 58.1% (n=821) reduction for the level 5 lockdown periods and a 61.8% (n=858) reduction over the post-lockdown periods (Figure 1).

Demographics and characteristics

The demographics and characteristics of patients are presented in Table 1. Significant differences during level 5 lockdown compared to the 2020 pre-lockdown period were seen in patient's age, referral type, triage category and disposition. The proportion of children younger than 1 year increased by 10.4% ($p<0.001$), with a decrease in the 1 to 5 year group (5.6%, $p=0.022$) and in patients over the age of 5 years (4.8%, $p=0.02$). The proportions in the age category changed as lockdown measures were eased; children over 5 years were the only group showing an increase (7.1%, $p=0.005$). An increase in the proportion of self referrals occurred (7.4%, $p<0.001$), with a subsequent decrease in referrals from primary healthcare clinics (6.9%, $p<0.001$) and general practitioners (0.4%, $p=0.754$). Children presenting during the level 5 lockdown periods were also sicker with a 2% increase in the proprotion of emergency (triaged red) cases ($p=0.018$), although the actual number of patients decreased (n=5). The difference in triage category most likely contributed to the proportional increase of inpatient referrals (5.6%, $p=0.001$), as well as patients referred for higher level of care (3.9%, $p=0.004$). This also resulted in a proportional decrease in patients being discharged directly home from the emergency centre (5.6%, $p=0.019$).

Table 1. Demographics and characteristics of paediatric patients presenting to the emergency centre during the level 5 COVID-19 lockdown period and corresponding 5-week periods immediately before and after the lockdown and for two previous years.

		2018			2019			2020		
Variables n (%)		**21 February – 26 March**	**27 March – 30 April**	**01 May – 04 June**	**21 February – 26 March**	**27 March – 30 April**	**01 May – 04 June**	**21 February – 26 March (Pre-lockdown)**	**27 March – 30 April (Level 5 lockdown)**	**01 May – 04 June (Post-lockdown)**
Age (year)	<1	210 (21.2%)	372 (31.4%)	368 (28.8%)	249 (19.7%)	351 (24.8%)	312 (22.5%)	243 (18.1%)	169 (28.5%)[a]	116 (21.9%)[b]
	1-5	528 (53.2%)	592 (50%)	677 (53%)	717 (56.7%)	766 (54.2%)	742 (53.5%)	787 (58.6%)	314 (53%)[a]	279 (52.6%)
	>5	254 (25.6%)	219 (18.5%)	233 (18.2%)	298 (23.6%)	296 (20.9%)	334 (24.1%)	312 (23.2%)	109 (18.4%)[a]	135 (25.5%)[b]
Gender	Female	436 (44%)	509 (43%)	588 (46%)	537 (42.5%)	609 (43.1%)	610 (43.9%)	565 (42.1%)	267 (45.1%)	251 (47.4%)
	Male	556 (56%)	674 (57%)	690 (54%)	727 (57.5%)	804 (56.9%)	778 (56.1%)	777 (57.9%)	325 (54.9%)	279 (52.6%)
Transport method	Self	785 (79.1%)	920 (77.8%)	1082 (84.7%)	1025 (81.1%)	1171 (82.9%)	1267 (91.3%)	1115 (83.1%)	489 (82.6%)	476 (89.8%)[b]
	Ambulance	130 (13.1%)	178 (15%)	193 (15.1%)	152 (12%)	133 (9.4%)	120 (8.6%)	145 (10.8%)	69 (11.7%)	52 (9.8%)
	Police or Fire service	2 (0.2%)	1 (0.1%)	1 (0.1%)	2 (0.2%)	4 (0.3%)	1 (0.1%)	0 (0%)	0 (0%)	0 (0%)
	Unknown	75 (7.6%)	84 (7.1%)	2 (0.2%)	85 (6.7%)	105 (7.4%)	0 (0%)	82 (6.1%)	34 (5.7%)	2 (0.4%)[b]
Arrival from	Scene / home	658 (66.3%)	835 (70.6%)	907 (71%)	931 (73.7%)	1069 (75.7%)	1067 (76.9%)	1000 (74.5%)	485 (81.9%)[a,c]	457 (86.2%)[d]
	Other healthcare facility	262 (26.4%)	266 (22.5%)	285 (22.3%)	250 (19.8%)	242 (17.1%)	220 (15.9%)	260 (19.4%)	74 (12.5%)[a,c]	52 (9.8%)[d]
	General Practitioner	72 (7.3%)	82 (6.9%)	86 (6.7%)	83 (6.6%)	99 (7%)	101 (7.3%)	81 (6%)	33 (5.6%)	21 (4%)[d]
	Unknown	0 (0%)	0 (0%)	0 (0%)	0 (0%)	3 (0.2%)	0 (0%)	1 (0.1%)	0 (0%)	0 (0%)
Triage category	Non-urgent (Green)	238 (24%)	202 (17.1%)	202 (15.8%)	311 (24.6%)	287 (20.3%)	241 (17.4%)	344 (25.6%)	142 (24%)	172 (32.5%)[b,d]
	Urgent (Yellow)	516 (52%)	622 (52.6%)	760 (59.5%)	639 (50.6%)	758 (53.6%)	733 (52.8%)	663 (49.4%)	300 (50.7%)	256 (48.3%)
	Very urgent (Orange)	181 (18.2%)	286 (24.2%)	255 (20%)	246 (19.5%)	294 (20.8%)	351 (25.3%)	267 (19.9%)	115 (19.4%)	78 (14.7%)[b,d]
	Emergency (Red)	33 (3.3%)	41 (3.5%)	35 (2.7%)	39 (3.1%)	40 (2.8%)	35 (2.5%)	30 (2.2%)	25 (4.2%)[a]	17 (3.2%)
	Unknown	24 (2.4%)	32 (2.7%)	26 (2%)	29 (2.3%)	34 (2.4%)	28 (2%)	38 (2.8%)	10 (1.7%)	7 (1.3%)
Disposition	Death	2 (0.2%)	0 (0%)	1 (0.1%)	1 (0.1%)	4 (0.3%)	3 (0.2%)	4 (0.3%)	4 (0.7%)	0 (0%)
	Referred to in-hospital disciplines	193 (19.5%)	251 (21.2%)	293 (22.9%)	210 (16.6%)	209 (14.8%)	159 (11.5%)	163 (12.1%)[e]	105 (17.7%)[a]	91 (17.2%)[d]
	Discharged	674 (67.9%)	770 (65.1%)	817 (63.9%)	862 (68.2%)	946 (66.9%)	983 (70.8%)	871 (64.9%)	351 (59.3%)[a,c]	346 (65.3%)[b,d]
	Absconded	28 (2.8%)	42 (3.6%)	58 (4.5%)	66 (5.2%)	99 (7%)	92 (6.6%)	160 (11.9%)[e]	33 (5.6%)[a]	13 (2.5%)[b,d]
	Transferred to higher level facility	58 (5.8%)	86 (7.3%)	62 (4.9%)	101 (8%)	90 (6.4%)	87 (6.3%)	92 (6.9%)	64 (10.8%)[a,c]	65 (12.3%)[d]
	Refer to other	37 (3.7%)	34 (2.9%)	47 (3.7%)	24 (1.9%)	65 (4.6%)	64 (4.6%)	52 (3.9%)[e]	35 (5.9%)	15 (2.8%)[b]

[a] Statistically significant difference ($p<0.05$) between pre-lockdown period 2020 and level 5 lockdown period 2020 (see supplementary table 1)

[b] Statistically significant difference (p<0.05) between level 5 lockdown period 2020 and post-lockdown period 2020 (see supplementary table 1)
[c] Statistically significant difference (p<0.05) between level 5 lockdown period 2019 and 2020 (see supplementary table 1)
[d] Statistically significant difference (p<0.05) between post-lockdown period 2019 and 2020 (see supplementary table 1)
[e] Statistically significant difference (p<0.05) between pre-lockdown period 2019 and 2020 (see supplementary table 1)

Diagnostic categories

The top three diagnostic categories during the level 5 lockdown were related to the respiratory system (n=141, 23.8%), injuries and poisonings (n=133, 22.5%), and infectious diseases (n=110, 18.6%). In the different age groups, infectious diseases were most frequent in the under 1 year group (n=52, 30.8%), respiratory-related diseases in the 1-5 year group (n=84, 26.8%), and injury-related presentations in the over 5 year group (n=46, 14.6%) (Table 2). The top five diagnostic categories per age group and per time period is presented in Supplementary table 2. The actual number of presentations during the level 5 lockdown decreased in all the diagnostic categories compared to the 2020 pre-lockdown period (Table 3). Significant reductions occurred in respiratory diseases (n=285, 66.9%, p<0.001), injuries (n=75, 36.1%, p<0.001), and infectious and parasitic diseases (n=57, 34.1%, p<0.001). Proportionally, diseases of the respiratory system decreased by 7.9%, infectious-related diseases increased by 6.2%, and injuries increased by 7.0% (Table 3) (see supplementary table 3 for the diagnostic categories for all the time periods). In admitted patients, actual infectious-related diseases decreased by 40% (n=24) and diseases of the respiratory system by 63% (n=67) during the lockdown period compared to 2019. A 28% (n=14) reduction was seen in actual infectious-related and respiratory-related diseases comparing the 2020 lockdown periods (see supplementary table 4 for the diagnostic categories of admitted patients). In patients transferred to higher level of care, actual infectious-related diseases increased by 91% (n=10) and injuries by 33% (n=4) during the lockdown period compared to 2019. A 30% (n=7) reduction was seen in the actual number of injuries and a 5% (n=1) increase in infectious-related diseases comparing the 2020 lockdown periods (see supplementary table 5 for the diagnostic categories of transferred patients).

Table 2. Top five diagnostic categories per age group presenting to the emergency centre during the level 5 COVID-19 lockdown period.

All			<1 year			1-5 year			> 5 year		
Rank	**ICD-10 Category**	**N (%)**	**Rank**	**ICD-10 Category**	**n (%)**	**Rank**	**ICD-10 Category**	**n (%)**	**Rank**	**ICD-10 Category**	**n (%)**
1	Respiratory system	141 (23.8)	1	Infectious diseases	52 (30.8)	1	Respiratory system	84 (26.8)	1	Injury and poisoning	46 (14.6)
2	Injury and poisoning	133 (22.5)	2	Respiratory system	43 (25.4)	2	Injury and poisoning	79 (25.2)	2	Respiratory system	14 (4.5)
3	Infectious diseases	110 (18.6)	3	Findings, not elsewhere classified	13 (7.7)	3	Infectious diseases	47 (15.0)	3	Infectious diseases	11 (3.5)

4	Nervous system	30 (5.1)	4	Skin and subcutaneous tissue	11 (6.5)	4	Nervous system	16 (5.1)	4	Nervous system	10 (3.2)
5	Skin and subcutaneous tissue	26 (4.4)	5	Injury and poisoning	8 (4.7)	5	Ear and mastoid process	14 (4.5)	5	Digestive system	5 (1.6)

ICD-10: International Statistical Classification of Diseases and Related Health Problems, 10th revision

Table 3. Actual and proportional differences of paediatric presentations to the emergency centre during the level 5 lockdown period, compared to similar time periods.

	2020 vs 2018									2020 vs 2019									2020					
	21 February – 26 March (Pre-lockdown)			27 March – 30 April (Level 5 lockdown)			01 May – 04 June (Post-lockdown)			21 February – 26 March (Pre-lockdown)			27 March – 30 April (Level 5 lockdown)			01 May – 04 June (Post-lockdown)			21 February – 26 March (Pre-lockdown) vs 27 March – 30 April (Level 5 lockdown)			27 March – 30 April (Level 5 lockdown) vs 01 May – 04 June (Post-lockdown)		
ICD-10 category	**Actual n (%)**	**Proportional**	**p**	**Actual n (%)**	**Proportional**	**p**	**Actual n (%)**	**Proportional**	**p**	**Actual n (%)**	**Proportional**	**p**	**Actual n (%)**	**Proportional**	**p**	**Actual n (%)**	**Proportional**	**p**	**Actual n (%)**	**Proportional**	**p**	**Actual n (%)**	**Proportional**	**p**
I Certain infectious and parasitic diseases	-53 (-31.7)	-9.8%	0.574	-97 (-88.2)	1.1%	0.564	-155 (-221.4)	-4.4%	0.210	-80 (-32.4)	-7.1%	***<0.001***	-118 (-51.8)	2.5%	0.191	-97 (-58.1)	1.2%	0.486	-57 (-34.1)	6.2%	***<0.001***	-40 (-36.4)	-5.4%	***0.015***
VI Diseases of the nervous system	21 (50)	1.0%	***<0.001***	14 (46.7)	3.7%	***<0.001***	-8 (-50)	1.1%	0.133	-7 (-14.3)	-0.8%	0.337	-14 (-31.8)	2.0%	***0.038***	-23 (-59.0)	0.2%	0.878	-12 (-28.6)	2.0%	0.050	-14 (-46.7)	-2.1%	0.097
VIII Diseases of the ear and mastoid process	40 (61.5)	2.3%	0.927	-23 (-104.5)	-0.1%	0.927	-52 (-371.4)	-2.6%	0.018	22 (51.2)	1.4%	0.076	-42 (-65.6)	-0.8%	0.469	-50 (-78.1)	-2.0%	0.053	-43 (-66.2)	-1.1%	0.287	-8 (-36.4)	-1.1%	0.316
X Diseases of	118 (2	0.7%	***<0.001***	-359	-18.5%	***<0.001***	-378	-14.8%	***<0.001***	-16 (-3.6)	-3.3%	0.081	-411 (-	-15.3%	***<0.001***	-466 (-	-17.9%	***<0.001***	-285 (-66.9)	-7.9%	***<0.001***	-7 (-5.0)	1.5%	0.579

the respiratory system	7.7)			(-254.6)			(-282.1)						74,5)			77.7)							
XI Diseases of the digestive system	-6 (-21.4)	-1.3%	0.370	-19 (-172.7)	-0.6%	0.370	-3 (-12.5)	2.4%	0.005	2 (7.7)	0.0%	1.000	-18 (-62.1)	-0.2%	0.862	1 (4.3)	2.8%	0.000	-17 (-60.7)	-0.2%	0.861	13 (118.2)	2.6%	0.015
XII Diseases of the skin and subcutaneous tissue	-33 (-67.3)	-4.6%	0.580	-33 (-126.9)	-0.6%	0.580	-26 (-108.3)	0.6%	0.547	1 (2.1)	-0.1%	0.819	-20 (-43.5)	1.1%	0.236	-12 (-33.3)	1.9%	***0.039***	-23 (-46.9)	0.7%	0.445	-2 (-7.7)	0.1%	1.000
XIV Diseases of the genitourinary system	7 (17.5)	-0.3%	0.329	-6 (-42.9)	0.7%	0.329	-13 (-108.3)	0.3%	0.674	22 (122.2)	1.6%	***0.008***	-13 (-48.5)	0.5%	0.604	-10 (-45.5)	0.7%	0.334	-26 (-65.0)	-0.6%	0.462	-2 (-14.3)	-0.1%	1.000
XVIII Symptoms, signs and abnormal clinical and laboratory findings,	39 (43.8)	1.6%	0.280	-39 (-156.0)	-1.2%	0.280	-27 (-87.1)	1.3%	0.241	38 (74.5)	2.6%	***0.004***	-45 (-64.3)	-0.8%	0.493	-42 (-57.5)	0.5%	0.652	-64 (-71.9)	-2.4%	***0.046***	6 (24.0)	1.6%	0.220

not elsewhere classified																							
XIX Injury, poisoning and certain other consequences of external causes	75 (36.1)	2.1%	***<0.001***	14 (10.5)	12.4%	***<0.001***	59 (38.6)	21.5%	***<0.001***	-1 (-0.5)	-1.0%	0.487	-12 (-8.3)	12.2%	***<0.001***	-21 (-12.1)	16.4%	***<0.001***	-75 (-36.1)	7.0%	***<0.001***	20 (15.0)	6.4%	***0.016***

Process times

All process times were significantly different between the various study periods (Table 4). Comparing median times between the level 5 lockdown period and the 2020 pre-lockdown period, time to triage decreased by 7 minutes (p<0.001), time to consultation by 91 minutes (p<0.001), time to deciding disposition by 76 minutes (p<0.001), and length of stay within the emergency centre by 41 minutes (p=0.003).

Table 4. Process times for paediatric patients (n=9308) presenting to the emergency centre during the 5-week COVID-19 level 5 lockdown period and corresponding periods for three years prior to the lockdown.

	2018			2019			2020			p
Process times (minutes), median(Q1-Q3)* [maximum]	**21 February – 26 March**	**27 March – 30 April**	**01 May – 04 June**	**21 February – 26 March**	**27 March – 30 April**	**01 May – 04 June**	**21 February – 26 March (Pre-lockdown)**	**27 March – 30 April (Level 5 lockdown)**	**01 May – 04 June (Post-lockdown)**	
Time to triage	12 (5-31) [581]	15 (4-39) [803]	20 (7-47) [460]	19 (6-47) [612]	22 (7-52) [565]	16 (5-43) [368]	19 (6-49) [665]	12 (4-33) [308]	14 (5-34) [1461]	<0.001
Time to consultation	81 (45-132) [1067]	95 (54-159) [905]	104 (59-171) [1222]	107 (61-187) [654]	119 (66-214) [742]	118 (65-208) [685]	140 (71-235) [872]	49 (42-122) [590]	59 (29-101) [1054]	<0.001
Time to disposition decision	146 (94-216) [1437]	157 (99-242) [1146]	160 (106-246) [1291]	190 (121-295) [1521]	193 (121-314) [1506]	191 (112-291) [1026]	245 (156-365) [3337]	169 (95-267) [1918]	123 (70-204) [1773]	<0.001
Time in emergency centre	188 (126-278) [1438]	205 (129-320) [1797]	207 (130-330) [3800]	274 (165-495) [2043]	262 (146-428) [1717]	251 (142-411) [2632]	311 (200-492) [3353]	270 (153-459) [2349]	164 (85-423) [1984]	<0.001

*Q1-Q3: 25th to 75th percentile

DISCUSSION

The volume of children visiting the emergency centre during and after the level 5 lockdown period was significantly lower than similar previous time periods. Significant reductions in the number of presentations were seen in respiratory diseases, infectious diseases and injuries (Table 3). A reduction in the proportion of diseases related to the respiratory system occurred in all age groups, while infectious diseases increased in younger patients (<1 year) and injuries increased in children older than one year.

The overall reduction in paediatric emergency centre visits is similar to experiences from the SARS and MERS pandemics, as people tend to avoid or delay attending hospitals due to the fear of contracting the communicable disease.[9–11] Anecdotal evidence do suggest that attendance to the primary healthcare

services also decreased. This is of concern and child health needs to be monitored closely over the coming 12 months. The likely reduction in immunisations, specifically measles, could result in outbreaks of non-COVID-19 communicable diseases causing more morbidity and mortality.[3] The impact of this would be substantially worse in impoverished communities.

The reduction in respiratory and infectious-related diseases were substantial contributors to the overall reduction in emergency centre attendance, although the proportion of children with infectious diseases increased. These reductions are most likely multifactorial, and one important consideration could be the closing of early childhood development centres. It has been well documented that children attending crèches have a higher incidence of infectious diseases, including respiratory tract infections.[18,19] About three quarters of paediatric emergency centre attendees at Mitchells Plain Hospital are children under the age of 5 years, of whom a large proportion will normally be in formal or informal crèches while their parents work. The lockdown measures forced most parents to stay at home, thereby further reducing children's exposure to infections (COVID-19 and other) as trips to shops or work were limited.

Children presenting with injuries and poisoning decreased by a third during the level 5 lockdown period, but increased proportionally by 7% (Table 3). This was not expected and could be from children bypassing the community healthcare centres; thus children with minor injuries also presented to the hospital. On the other hand, the home is one of the most dangerous places for children. It is estimated that around 90% of unintentional injuries in young children occur in or around their home when they are supposedly being supervised by a caregiver.[20] Injury risk could also have increased if children became bored at home, while parents were most likely frustrated in the constant supervision of the children. Furthermore, anecdotal evidence suggest that the number of child abuse cases did not decrease during the lockdown periods and remain on a similar trend than before.[21] Another possible reason is the longstanding problem in South Africa where many children are looking after themselves and other children, with an understandable lack of adequate supervision.

The main strength of the study is the use of a comprehensive database that is completed in real time. Although data are not cross-checked, we expect the data to be adequately reflecting the truth. However, care should be taken to generalise the results of the study to other healthcare facilities as it reflects a single centre in a fairly distinctive setting. Diseases were categorised according to diagnostic codes (ICD-10) assigned by attending physicians. A diagnostic code was not assigned to around 10% of patients. We also did not validate whether the correct diagnosis were made, neither did we attempt to ensure that the correct diagnostic code were assigned to the diagnosis. This could have resulted in non-systematic error.

CONCLUSION

Significantly less children presented to the emergency centre since the implementation of the national COVID-19 level 5 lockdown. The closure of early childhood development centres and schools, together with the restriction of movement of children and their caregivers, markedly reduced the infectious and

respiratory-related component of paediatric attendees. The burden of injuries in resource-limited societies remains a problem, even during a period of national lockdown. However, the change in paediatric presentations to the emergency centre across all COVID-19 lockdown levels remains unknown and should be investigated in future.

CONTRIBUTIONS

DJvH and CH conceived the study. MA, CH, and KE undertook data collection. MA and DJvH cleaned the data, and DJvH and CH did the data analyses. MA drafted the manuscript and the remaining authors critiqued the paper for important intellectual content. All authors read and approved the final version of the manuscript. MA is the guarantor.

FUNDING

The study was self-funded.

COMPETING INTERESTS

None declared.

ETHICS APPROVAL

The study was approved by the Health Research Ethics Committee of Stellenbosch University (Ref: N20/04/009_COVID-19) and included a waiver of informed consent.

FIGURE CAPTIONS

Figure 1. Number of paediatric emergency centre visits over a 5-week period before, during and after the COVID-19 level 5 lockdown.

WHAT IS ALREADY KNOWN ON THIS TOPIC

- The volume of children attending emergency centres varied during previous epidemics
- Paediatric emergency centre attendances decreased during COVID-19

WHAT THIS STUDY ADDS

- Significantly less children presented to the emergency centre since the implementation of national COVID-19 level 5 lockdown
- A greater proportion, but smaller numbers of younger and sicker children attended the emergency centre during the COVID-19 lockdown
- Marked reductions occurred in respiratory diseases, infectious-related diseases, and in injuries
- The proportion of infectious diseases increased in patients <1 year, while injuries increased in older children

REFERENCES

1 Krug SE, Bojko T, Dolan MA, *et al.* Access to Optimal Emergency Care for Children. *Pediatrics* 2007;**119**:161–4. doi:10.1542/peds.2006-2900

2 Quaglio G, Pizzol D, Bome D, *et al.* Maintaining Maternal and Child Health Services During the Ebola Outbreak: Experience from Pujehun, Sierra Leone. *PLoS Curr* 2016;**8**. doi:10.1371/currents.outbreaks.d67aea257f572201f835772d7f188ba5

3 World Health Organization. Vaccination In Acute Humanitarian Emergencies. Geneva: 2017. https://www.who.int/immunization/documents/who_ivb_17.03/en/ (accessed 20 Jun 2020).

4 World Health Organization. WHO Timeline - COVID-19. 2020.https://www.who.int/news-room/detail/27-04-2020-who-timeline---covid-19 (accessed 20 Jun 2020).

5 COVID-19 Risk Adjusted Strategy - SA Corona Virus Online Portal. https://sacoronavirus.co.za/covid-19-risk-adjusted-strategy/ (accessed 2 Sep 2020).

6 Torres JP, O'Ryan M, Herve B, *et al.* Impact of the novel influenza A (H1N1) during the 2009 autumn-winter season in a large hospital setting in Santiago, Chile. *Clin Infect Dis* 2010;**50**:860–8. doi:10.1086/650750

7 Kwan-Gett TS, Baer A, Duchin JS. Spring 2009 H1N1 influenza outbreak in King Country Washington. *Disaster Med Public Health Prep* 2009;**3**. doi:10.1097/DMP.0b013e3181c6b818

8 Falconer E, Keddy M, Milne WK. Impact of the H1N1 influenza pandemic in two rural emergency departments. 2012;**12**. doi:10.22605/RRH2063

9 Lee SY, Khang YH, Lim HK. Impact of the 2015 middle east respiratory syndrome outbreak on emergency care utilization and mortality in South Korea. *Yonsei Med J* 2019;**60**:796–803. doi:10.3349/ymj.2019.60.8.796

10 Paek SH, Kim DK, Lee JH, *et al.* The impact of middle east respiratory syndrome outbreak on trends in emergency department utilization patterns. *J Korean Med Sci* 2017;**32**:1576–80. doi:10.3346/jkms.2017.32.10.1576

11 Huang H-H, Yen DH-T, Kao W-F, *et al.* Declining emergency department visits and costs during the severe acute respiratory syndrome (SARS) outbreak. *J Formos Med Assoc* 2006;**105**:31–7. doi:10.1016/S0929-6646(09)60106-6

12 Morris D, Rogers M, Kissmer N, *et al.* Impact of lockdown measures implemented during the Covid-19 pandemic on the burden of trauma presentations to a regional emergency department in Kwa-Zulu Natal, South Africa. *African J Emerg Med* Published Online First: 16 June 2020. doi:10.1016/j.afjem.2020.06.005

13 Statistics South Africa. Mitchells Plain. http://www.statssa.gov.za/?page_id=4286&id=329. (accessed 17 Apr 2020).

14 Statistics South Africa. Philippi. http://www.statssa.gov.za/?page_id=4286&id=323 (accessed 17 Apr 2020).

15 Mitchell's Plain Nodal Economic Development Profile Western Cape. https://mitchellsplain.files.wordpress.com/2011/07/mitchells_20plain_20narrative.pdf

16 South African Triage Group. The South African Triage Scale (SATS). 2012.https://emssa.org.za/special-interest-groups/the-south-african-triage-scale-sats/ (accessed 28 Aug 2019).

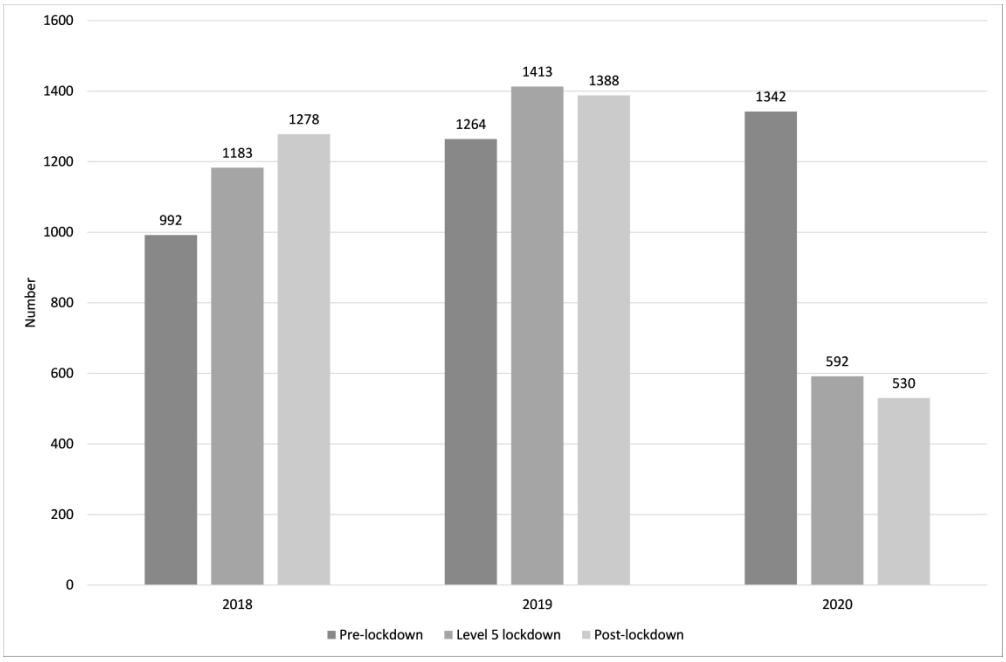
17 Hendrikse C, Parak M, van Hoving DJ. A descriptive analysis of the effect of the national COVID-19 lockdown on the workload and case mix of patients presenting to a district-level emergency centre in Cape Town, South Africa. *S Afr Med J*

18 Kamper-Jørgensen M, Wohlfahrt J, Simonsen J, *et al.* Population-based study of the impact of childcare attendance on hospitalizations for acute respiratory infections. *Pediatrics* 2006;**118**:1439–46. doi:10.1542/peds.2006-0373

19 Lu N, Samuels ME, Shi L, *et al.* Child day care risks of common infectious diseases revisited. *Child Care Health Dev* 2004;**30**:361–8. doi:10.1111/j.1365-2214.2004.00411.x

20 World Health Organization. World report on child injury prevention. Geneva: : World Health Organization 2015. https://www.who.int/violence_injury_prevention/child/injury/world_report/en/ (accessed 22 Jun 2020).

21 Cleary K. Fear, sadness and anger: The hidden impact of lockdown on children. City Press. 2020.https://www.news24.com/citypress/News/fear-sadness-and-anger-the-hidden-impact-of-lockdown-on-children-20200527 (accessed 23 Jun 2020).



258x168mm (500 x 500 DPI)

Supplementary table 1. Differences between different study periods of demographic and clinical characteristics of paediatric patients presenting to the emergency centre

	2020 vs 2019						2020			
	21 February – 26 March		27 March – 30 April		01 May – 04 June		Pre-lockdown vs Level 5 lockdown		Level 5 lockdown vs Post-lockdown	
Variables n (%)	**n (%)**	**p**	**n (%)**	**p**	**n (%)**	**p**	**n (%)**	**p**	**n (%)**	**p**
Age (year)										
<1	-6 (-2.4)	0.317	-182 (-51.9)	0.094	-196 (-62.8)	0.806	-74 (-30.5)	<0.001	-53 (-31.4)	0.011
1-5	70 (9.7)	0.322	-452 (-59.0)	0.659	-463 (-62.4)	0.759	-473 (-60.1)	0.022	-35 (-11.1)	0.905
>5	14 (4.)	0.853	-187 (-63.2)	0.201	-199 (-59.6)	0.553	-203 (-65.1)	0.020	26 (23.9)	0.005
Gender										
Female	28 (5.2)	0.874	-342 (-56.2)	0.430	-359 (-58.9)	0.182	-298 (-52.7)	0.232	-16 (-6.0)	0.472
Male	50 (6.9)	0.000	-479 (-59.6)		-499 (-64.1)	0.000	-452 (-58.2)	0.000	-46 (-14.2)	0.000
Transport method										
Self	90 (8.8)	0.201	-682 (-58.2)	0.897	-791 (-62.4)	0.330	-626 (-56.1)	0.844	-13 (-2.7)	0.001
Ambulance	-7 (-4.6)	0.355	-64 (-48.1)	0.143	-68 (-56.7)	0.475	-76 (-52.4)	0.637	-17 (-24.6)	0.336
Police or Fire service	-2 (-100)	0.235	-4 (-100)	0.326	-1 (-100)	1.000	0 (0)	---	0 (0)	---
Unknown	-3 (-3.5)	0.575	-71 (-67.6)	0.179	2 (200)	0.076	-48 (-58.5)	0.758	-32 (-94.1)	<0.001
Arrival from										
Scene / home	69 (7.4)	0.623	-584 (-54.6)	0.002	-610 (-57.2)	<0.001	-515 (-51.5)	<0.001	-28 (-5.8)	0.051
Other healthcare facility	10 (4)	0.805	-168 (-69.4)	0.011	-168 (-76.4)	0.001	-186 (-71.5)	<0.001	-22 (-29.7)	0.157
General Practitioner	-2 (-2.4)	0.628	-66 (-66.7)	0.277	-80 (-79.2)	0.009	-48 (-59.3)	0.754	-12 (-36.4)	0.213
Unknown	1 (100)	1.000	-3 (-100)	0.560	0 (0)	---	-1 (-100)	1.000	0 (0)	---
Triage category										
Non-urgent (Green)	33 (10.6)	0.557	-145 (-50.5)	0.073	-69 (-28.6)	<0.001	-202 (-58.2)	0.460	-30 (-14.2)	0.002
Urgent (Yellow)	24 (3.7)	0.292	-458 (-60.4)	0.239	-477 (-65.1)	0.082	-363 (-58.7)	0.622	-44 (-21.1)	0.437
Very urgent (Orange)	21 (8.5)	0.805	-179 (-60.9)	0.504	-273 (-77.8)	<0.001	-152 (-54.8)	0.853	-37 (-14.7)	0.039
Emergency (Red)	-9 (-23.1)	0.182	-15 (-37.5)	0.128	-18 (-51.4)	0.432	-5 (-56.9)	0.018	-8 (-32.2)	0.432
Unknown	9 (31.0)	0.458	-24 (-70.6)	0.404	-21 (-75)	0.347	-28 (-73.7)	0.155	-3 (-30)	0.636
Disposition										
Referred to in-hospital disciplines	3 (300)	0.376	0 (0)	0.246	-3 (-100)	0.565	0 (0)	0.258	-4 (-100)	0.127
Discharged	-47 (-22.4)	0.001	-104 (-49.8)	0.106	-68 (-42.8)	0.001	-58 (-35.6)	0.001	-14 (-13.3)	0.814
Absconded	9 (1.0)	0.081	-595 (-62.9)	0.001	-637 (-64.8)	0.020	-520 (-59.7)	0.019	-5 (-1.4)	0.042
Transferred to higher level facility	94 (142.4)	0.001	-66 (-66.7)	0.277	-79 (-85.9)	0.001	-127 (-79.4)	0.001	-20 (-60.6)	0.010
Refer to other	-9 (-8.9)	0.295	-26 (-28.9)	0.001	-22 (-25.3)	<0.001	-28 (-30.4)	0.004	1 (1.6)	0.455
Referred to in-hospital disciplines	28 (116.7)	0.003	-30 (-46. 2)	0.260	-49 (-76.6)	0.094	-17 (-32.7)	0.056	-20 (-57.1)	0.014

Pre-lockdown period: 21 February – 26 March; Lockdown period: 27 March – 30 April; Post-lockdown period: 01 May – 04 June

Supplementary table 2. Top five diagnostic categories per age group presenting to the emergency centre during the level 5 COVID-19 lockdown period and similar time periods.

27 March – 30 April 2019		21 February – 26 March 2020 (Pre-lockdown)		27 March – 30 April 2020 (level 5 lockdown)		01 May – 04 June 2020 (Post-lockdown)	
ICD-10 Category	**n (%)**	**ICD-10 Category**	**n (%)**	**ICD-10 Category**	**n (%)**	**ICD-10 Category**	**n (%)**
All							
Respiratory system	442 (35.0)	Respiratory system	426 (31.7)	Respiratory system	141 (23.8)	Injury and poisoning	153 (28.9)
Infectious diseases	247 (19.5)	Injury and poisoning	208 (15.5)	Injury and poisoning	133 (22.5)	Respiratory system	134 (25.3)
Injury and poisoning	209 (16.5)	Infectious diseases	167 (12.4)	Infectious diseases	110 (18.6)	Infectious diseases	70 (13.2)
Findings, not elsewhere classified	51 (4.0)	Findings, not elsewhere classified	89 (6.6)	Nervous system	30 (5.1)	Findings, not elsewhere classified	31 (5.8)
Nervous system	49 (3.9)	Ear and mastoid process	65 (4.8)	Skin and subcutaneous tissue	26 (4.4)	Digestive system	24 (4.5)
						Skin and subcutaneous tissue	24 (4.5)
<1 year							
Respiratory system	200 (57.0)	Respiratory system	78 (32.1)	Infectious diseases	52 (30.8)	Infectious diseases	33 (28.4)
Infectious diseases	65 (18.5)	Infectious diseases	61 (25.1)	Respiratory system	43 (25.4)	Respiratory system	29 (25.0)
Findings, not elsewhere classified	11 (3.1)	Findings, not elsewhere classified	20 (8.2)	Findings, not elsewhere classified	13 (7.7)	Injury and poisoning	13 (11.2)
Injury and poisoning	10 (2.8)	Injury and poisoning	18 (7.4)	Skin and subcutaneous tissue	11 (6.5)	Skin and subcutaneous tissue	9 (7.8)
Skin and subcutaneous tissue	7 (2.0)	Skin and subcutaneous tissue	10 (4.1)	Injury and poisoning	8 (4.7)	Digestive system	6 (5.2)
Ear and mastoid process	7 (2.0)						
1-5 year							
Respiratory system	294 (38.4)	Respiratory system	284 (36.1)	Respiratory system	84 (26.8)	Injury and poisoning	93 (33.3)
Infectious diseases	125 (16.3)	Injury and poisoning	108 (13.7)	Injury and poisoning	79 (25.2)	Respiratory system	79 (28.3)
Injury and poisoning	78 (10.2)	Infectious diseases	91 (11.6)	Infectious diseases	47 (15.0)	Infectious diseases	23 (8.2)
Ear and mastoid process	50 (6.5)	Ear and mastoid process	51 (6.5)	Nervous system	16 (5.1)	Findings, not elsewhere classified	20 (7.2)
Findings, not elsewhere classified	32 (4.2)	Findings, not elsewhere classified	36 (4.6)	Ear and mastoid process	14 (4.5)	Ear and mastoid process	12 (4.3)
> 5 year							
Respiratory system	58 (7.6)	Injury and poisoning	82 (10.4)	Injury and poisoning	46 (14.6)	Injury and poisoning	47 (16.8)
Injury and poisoning	57 (7.4)	Respiratory system	64 (8.1)	Respiratory system	14 (4.5)	Respiratory system	26 (9.3)
Infectious diseases	38 (5.0)	Findings, not elsewhere classified	33 (4.2)	Infectious diseases	11 (3.5)	Infectious diseases	14 (5.0)
Findings, not elsewhere classified	27 (3.5)	Nervous system	19 (2.4)	Nervous system	10 (3.2)	Digestive system	12 (4.3)
Nervous system	24 (3.1)	Skin and subcutaneous tissue	16 (2.0)	Digestive system	5 (1.6)	Nervous system	7 (2.5)
		Genitourinary system	16 (2.0)				

ICD-10: International Statistical Classification of Diseases and Related Health Problems, 10th revision

Supplementary table 3. Diagnostic categories of paediatric patients presenting to the emergency centre during the level 5 COVID-19 lockdown period and corresponding time periods.

	2018			2019			2020		
ICD-10 Category, n(%)	**21 February – 26 March**	**27 March – 30 April**	**01 May – 04 June**	**21 February – 26 March**	**27 March – 30 April**	**01 May – 04 June**	**21 February – 26 March (Pre-lockdown)**	**27 March – 30 April (Level 5 lockdown)**	**01 May – 04 June (Post-lockdown)**
I Certain infectious and parasitic diseases	220 (22.2%)	207 (17.5%)	225 (17.6%)	247 (19.5%)	228 (16.1%)	167 (12%)	167 (12.4%)	110 (18.6%)	70 (13.2%)
II Neoplasms	1 (0.1%)	2 (0.2%)	0 (0%)	0 (0%)	3 (0.2%)	2 (0.1%)	0 (0%)	0 (0%)	0 (0%)
III Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	0 (0%)	0 (0%)	1 (0.1%)	2 (0.2%)	1 (0.1%)	0 (0%)	1 (0.1%)	1 (0.2%)	3 (0.6%)
IV Endocrine, nutritional and metabolic diseases	1 (0.1%)	1 (0.1%)	7 (0.5%)	8 (0.6%)	7 (0.5%)	8 (0.6%)	2 (0.1%)	1 (0.2%)	2 (0.4%)
V Mental and behavioural disorders	1 (0.1%)	3 (0.3%)	3 (0.2%)	2 (0.2%)	0 (0%)	6 (0.4%)	0 (0%)	2 (0.3%)	0 (0%)
VI Diseases of the nervous system	21 (2.1%)	16 (1.4%)	24 (1.9%)	49 (3.9%)	44 (3.1%)	39 (2.8%)	42 (3.1%)	30 (5.1%)	16 (3%)
VII Diseases of the eye and adnexa	6 (0.6%)	4 (0.3%)	8 (0.6%)	10 (0.8%)	11 (0.8%)	14 (1%)	9 (0.7%)	2 (0.3%)	1 (0.2%)
VIII Diseases of the ear and mastoid process	25 (2.5%)	45 (3.8%)	66 (5.2%)	43 (3.4%)	64 (4.5%)	64 (4.6%)	65 (4.8%)	22 (3.7%)	14 (2.6%)
IX Diseases of the circulatory system	0 (0%)	0 (0%)	2 (0.2%)	3 (0.2%)	6 (0.4%)	2 (0.1%)	1 (0.1%)	1 (0.2%)	0 (0%)
X Diseases of the respiratory system	308 (31%)	500 (42.3%)	512 (40.1%)	442 (35%)	552 (39.1%)	600 (43.2%)	426 (31.7%)	141 (23.8%)	134 (25.3%)
XI Diseases of the digestive system	34 (3.4%)	30 (2.5%)	27 (2.1%)	26 (2.1%)	29 (2.1%)	23 (1.7%)	28 (2.1%)	11 (1.9%)	24 (4.5%)
XII Diseases of the skin and subcutaneous tissue	82 (8.3%)	59 (5%)	50 (3.9%)	48 (3.8%)	46 (3.3%)	36 (2.6%)	49 (3.7%)	26 (4.4%)	24 (4.5%)
XII Diseases of the musculoskeletal system and connective tissue	1 (0.1%)	6 (0.5%)	3 (0.2%)	8 (0.6%)	17 (1.2%)	8 (0.6%)	2 (0.1%)	2 (0.3%)	7 (1.3%)
XIV Diseases of the genitourinary system	33 (3.3%)	20 (1.7%)	25 (2%)	18 (1.4%)	27 (1.9%)	22 (1.6%)	40 (3%)	14 (2.4%)	12 (2.3%)
XV Pregnancy, childbirth and the puerperium	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (0.2%)
XVI Certain conditions originating in the perinatal period	0 (0%)	1 (0.1%)	3 (0.2%)	2 (0.2%)	2 (0.1%)	2 (0.1%)	2 (0.1%)	4 (0.7%)	3 (0.6%)
XVII Congenital malformations, deformations and chromosomal abnormalities	1 (0.1%)	0 (0%)	1 (0.1%)	1 (0.1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (0.4%)
XVIII Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	50 (5%)	64 (5.4%)	58 (4.5%)	51 (4%)	70 (5%)	73 (5.3%)	89 (6.6%)	25 (4.2%)	31 (5.8%)
XIX Injury, poisoning and certain other consequences of external causes	133 (13.4%)	119 (10.1%)	94 (7.4%)	209 (16.5%)	145 (10.3%)	174 (12.5%)	208 (15.5%)	133 (22.5%)	153 (28.9%)
XX External causes of morbidity and mortality	36 (3.6%)	41 (3.5%)	40 (3.1%)	6 (0.5%)	9 (0.6%)	8 (0.6%)	11 (0.8%)	4 (0.7%)	5 (0.9%)
XXI Factors influencing health status and contact with health services	6 (0.6%)	10 (0.8%)	14 (1.1%)	14 (1.1%)	9 (0.6%)	2 (0.1%)	15 (1.1%)	8 (1.4%)	7 (1.3%)
Unknown	33 (3.3%)	55 (4.6%)	115 (9%)	75 (5.9%)	143 (10.1%)	138 (9.9%)	185 (13.8%)	55 (9.3%)	21 (4%)

Supplementary table 4. Diagnostic categories of paediatric patients admitted during the level 5 COVID-19 lockdown period and corresponding 5-week periods immediately before and after the lockdown and for two previous years.

	2018			2019			2020		
	21 February – 26 March	27 March – 30 April	01 May – 04 June	21 February – 26 March	27 March – 30 April	01 May – 04 June	21 February – 26 March (Pre-lockdown)	27 March – 30 April (Level 5 lockdown)	01 May – 04 June (Post-lockdown)
ICD-10 category	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**
I Certain infectious and parasitic diseases	82 (42.5%)	78 (31.1%)	85 (29.0%)	64 (30.5%)	60 (28.7%)	37 (23.3%)	50 (30.7%)	36 (34.3%)	29 (31.9%)
VI Diseases of the nervous system	9 (4.7%)	8 (3.2%)	8 (2.7%)	28 (13.3%)	19 (9.1%)	12 (7.5%)	20 (12.3%)	7 (6.7%)	4 (4.4%)
VIII Diseases of the ear and mastoid process	3 (1.6%)	1 (0.4%)	2 (0.7%)	1 (0.5%)	3 (1.4%)	8 (5.0%)	6 (3.7%)	1 (1.0%)	0 (0.0%)
X Diseases of the respiratory system	73 (37.8%)	140 (55.8%)	131 (44.7%)	98 (46.7%)	107 (51.2%)	72 (45.4%)	56 (34.4%)	40 (38.1%)	37 (40.7%)
XI Diseases of the digestive system	2 (1.0%)	1 (0.4%)	1 (0.3%)	1 (0.5%)	0 (0.0%)	2 (1.3%)	2 (1.2%)	2 (1.9%)	0 (0.0%)
XII Diseases of the skin and subcuta	7 (3.6%)	4 (1.6%)	1 (0.3%)	1 (0.5%)	3 (1.4%)	1 (0.6%)	4 (2.5%)	0 (0.0%)	1 (1.1%)

neous tissue									
XIV Diseases of the genitourinary system	4 (2. %)	1 (0.4%)	0 (0.0%)	2 (1.0%)	1 (0.5%)	0 (0.0%)	7 (4.3%)	4 (3.8%)	3 (3.3%)
XVIII Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	10 (5.2%)	14 (5.6%)	15 (5.1%)	9 (4.3%)	6 (2.9%)	14 (8.8%)	13 (8.0%)	6 (5.7%)	5 (5.5%)
XIX Injury, poisoning and certain other consequences of external causes	1 (0.5%)	1 (0.4%)	5 (1.7%)	1 (0.5%)	1 (0.5%)	2 (1.3%)	3 (1.8%)	1 (1.0%)	3 (3.3%)
Other	2 (1.0%)	3 (1.2%)	45 (15.4%)	5 (2.4%)	9 (4.3%)	11 (6.9%)	2 (1.2%)	8 (7.6%)	9 (9.9%)
	193 (100%)	251 (100%)	293 (100%)	210 (100%)	209 (100%)	159 (100%)	163 (100%)	105 (100%)	91 (100%)

Supplementary table 5. Diagnostic categories of paediatric patients transferred to higher level of care during the level 5 COVID-19 lockdown period and corresponding 5-week periods immediately before and after the lockdown and for two previous years.

	2018			2019			2020		
	21 February – 26 March	27 March – 30 April	01 May – 04 June	21 February – 26 March	27 March – 30 April	01 May – 04 June	21 February – 26 March (Pre-lockdown)	27 March – 30 April (Level 5 lockdown)	01 May – 04 June (Post-lockdown)
ICD-10 category	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**
I Certain infectious and parasitic diseases	9 (15.5%)	15 (17.4%)	7 (11.3%)	15 (14.9%)	11 (12.2%)	11 (12.6%)	20 (21.7%)	21 (32.8%)	7 (10.8%)
VI Diseases of the nervous system	5 (8.6%)	5 (5.8%)	5 (8.1%)	8 (7.9%)	7 (7.8%)	12 (13.8%)	7 (7.6%)	6 (9.4%)	3 (4.6%)
X Diseases of the respiratory system	8 (13.8%)	23 (26.7%)	15 (24.2%)	22 (21.8%)	30 (33.3%)	20 (23.0%)	10 (10.9%)	6 (9.4%)	12 (18.5%)
XI Diseases of the digestive system	8 (13.8%)	6 (7.0%)	2 (3.2%)	5 (5.0%)	7 (7.8%)	5 (5.7%)	11 (12.0%)	3 (4.7%)	11 (16.9%)
XII Diseases of the skin and subcutaneous tissue	10 (17.2%)	6 (7.0%)	9 (14.5%)	9 (8.9%)	7 (7.8%)	4 (4.6%)	10 (10.9%)	6 (9.4%)	3 (4.6%)
XIV Diseases of the genitouri	0 (0.0%)	2 (2.3%)	0 (0.0%)	2 (2.0%)	1 (1.1%)	3 (3.4%)	4 (4.3%)	2 (3.1%)	1 (1.5%)

nary system									
XVIII Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	1 (1.7%)	4 (4.7%)	2 (3.2%)	3 (3.0%)	7 (7.8%)	1 (1.1%)	3 (3.3%)	0 (0.0%)	2 (3.1%)
XIX Injury, poisoning and certain other consequences of external causes	15 (25.9%)	16 (18.6%)	13 (21.0%)	30 (29.7%)	12 (13.3%)	25 (28.7%)	23 (25.0%)	16 (25.0%)	23 (35.4%)
Other	2 (3.4%)	9 (10.5%)	9 (14.5%)	7 (6.9%)	8 (8.9%)	6 (6.9%)	4 (4.3%)	4 (6.3%)	3 (4.6%)
	58 (100%)	86 (100%)	62 (100%)	101 (100%)	90 (100%)	87 (100%)	92 (100%)	64 (100%)	65 (100%)

BMJ Paediatrics Open

Cross-sectional study of paediatric case mix presenting to an emergency centre in Cape Town, South Africa during COVID-19

Journal:	*BMJ Paediatrics Open*
Manuscript ID	bmjpo-2020-000801.R2
Article Type:	Original research
Date Submitted by the Author:	08-Sep-2020
Complete List of Authors:	Akuaake, Lembi; Stellenbosch University Faculty of Medicine and Health Sciences, Division of Emergency Medicine Hendrikse, Clint; University of Cape Town, Division of Emergency Medicine; Mitchells Plain Hospital and Heideveld Hospital, Emergency Centre Spittal, Graeme; Mitchells Plain Hospital, Paediatric Department Evans, Katya; Mitchells Plain Hospital and Heideveld Hospital, Emergency Centre; University of Cape Town, Division of Emergency Medicine van Hoving, Daniël; Stellenbosch University Faculty of Medicine and Health Sciences, Division of Emergency Medicine
Keywords:	Epidemiology, Health services research

I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our licence.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which Creative Commons licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

Cross-sectional study of paediatric case mix presenting to an emergency centre in Cape Town, South Africa during COVID-19

[1]Lembi Magano Akuaake, [2,3]Clint Hendrikse, [4]Graeme Spittal, [2,3]Katya Evans, [1]Daniël Jacobus van Hoving

[1]Division of Emergency Medicine, Stellenbosch University, Cape Town, South Africa

[2]Mitchells Plain Hospital and Heideveld Hospital Emergency Centres, Cape Town, South Africa

[3]Division of Emergency Medicine, University of Cape Town, Cape Town, South Africa

[4]Paediatric Department, Mitchells Plain Hospital, Cape Town, South Africa

Corresponding author: Daniël J. van Hoving

Division of Emergency Medicine, Stellenbosch University

PO Box 241

Cape Town, 8000

nvhoving@sun.ac.za

Number of tables: 4

Number of figures: 1

Word count: 2744

ABSTRACT

Objective

To describe and compare the effect of level 5 lockdown measures on the workload and case mix of paediatric patients presenting to a district-level emergency centre in Cape Town, South Africa.

Methods

Paediatric patients (<13 years) presenting to Mitchells Plain Hospital were included. The level 5 lockdown period (27/03/2020 – 30/04/2020) was compared to similar 5-week periods immediately before (21/02/2020 – 26/03/2020) and after the lockdown (01/05/2020 – 04/06/2020), and to similar time periods during 2018 and 2019. Patient demographics, characteristics, ICD-10 (International Statistical Classification of Diseases and Related Health Problems 10th Revision) diagnosis, disposition and process times were collected from an electronic patient tracking and registration database. The Chi-square test and the independent samples median test were used for comparisons.

Results

Emergency centre visits during the lockdown period (n=592) decreased by 58% compared to 2019 (n=1413) and by 56% compared to the 2020 pre-lockdown period (n=1342). The proportion of under 1 year olds increased by 10.4% (p<0.001), with a 7.4% increase in self-referrals (p<0.001) and a 6.9% reduction in referrals from clinics (p<0.001). Proportionally more children were referred to inpatient disciplines (5.6%, p=0.001) and to a higher level of care (3.9%, p=0.004). Significant reductions occurred in respiratory diseases (66.9%, p<0.001), injuries (36.1%, p<0.001), and infectious diseases (34.1%, p<0.001). All process times were significantly different between the various study periods.

Conclusion

Significantly less children presented to the emergency centre since the implementation of the COVID-19 lockdown, with marked reductions in respiratory and infectious-related diseases and in injuries.

KEYWORDS

COVID-19, emergency centre, case mix, paediatric

INTRODUCTION

Paediatric emergency care decreases childhood morbidity and mortality, but an epidemic has the potential to disrupt access to care and essential child health services.[1–3]

The corona virus disease (COVID-19) was declared a global pandemic by the World Health Organization (WHO) on 11 March 2020 and is caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).[4] The pandemic resulted in most countries implementing social distancing measures to curb the spread of the disease. The South African government implemented a national lockdown on 27 March 2020, consisting of five levels.[5] Level 5 is the most restrictive with only essential services permitted to operate and strict limitations on public transport services with regards to capacity and operating times. The sale of alcohol and tobacco is prohibited as well as any form of exercise in public spaces. Lower levels are a stepwise easing of the restrictions imposed on level 5 in varying degrees to attempt to limit community transmission and resurgence of the virus, while allowing for economic recovery. Level 1 allows for near normal activity to resume but with the recommended public health guidelines to be followed at all times, including wearing a facemask, maintaining social distancing of at least 2 meters and frequently washing or sanitising hands. The South African lockdown started at level 5, which lasted five weeks (27 March – 30 April 2020) and was followed by level 4 (1 May – 31 May 2020). Level 3 restrictions were implemented on 1 June 2020 and was still in place at the time of data collection.

The implemented lockdown measures under level 5 resulted in all non-urgent healthcare appointments being cancelled, including the de-escalation of services at community healthcare centres and the rescheduling of elective surgeries and outpatient department visits at hospital level. An upsurge in patients visiting the emergency centre was anticipated as most other healthcare services were de-escalated. Furthermore, the pandemic and subsequent lockdown periods coincided with autumn and the beginning of winter where an increase in respiratory-related cases are typically experienced, especially in the paediatric population. On the other hand, the effect of the closing of early childhood development centres and schools, as well as most parents forced to work from home, are unknown but could also change the number and type of presentations to the emergency centre.

Previous studies presented conflicting results of health care utilisation during an epidemic. An increase in paediatric patients presenting to emergency centres was seen during the swine flu (H1N1pdm09 virus) pandemic in 2009.[6–8] However, paediatric-related presentations decreased by up to 40% during the 2015 Middle East respiratory syndrome (MERS) epidemic in Korea.[9,10] A more pronounced decrease (80%) was witnessed during the 2003 Severe Acute Respiratory Syndrome (SARS) epidemic in Taiwan.[11] A decline in trauma cases presenting to emergency centres across South Africa has already been noticed,[12] but the effect of the national lockdown on paediatric presentations remains unclear. The aim of the study was to describe and compare the effect of the level 5 national COVID-19 lockdown measures on the workload and case mix of paediatric patients presenting to a district-level emergency centre in Cape Town, South Africa.

METHODS

Study design

A descriptive analysis was conducted on existing data. Data was extracted from an existing database that collects routine data prospectively (in real time).

Study setting

Mitchells Plain Hospital is a 365-bed hospital providing district hospital health services to the surrounding community. It serves a low- to middle-income health district of approximately 600 000 people.[13,14] The health district has many social challenges, including gangsterism, crime, and drug abuse. Interpersonal violence and other injuries are particularly prevalent during weekends.[15] Mitchells Plain Hospital is situated on the outskirts of Cape Town and has an emergency centre which manages around 4 100 patients per month; 950 being children under the age of 13 years. A quarter of the children are deemed very urgent or emergent at presentation (orange or red according to the South African Triage Scale)[16] and an average of 135 are admitted to the inpatient paediatric service. Monthly paediatric presentations increase to around 1 200 during the annual respiratory surge season (March – June), of which about 190 are admitted. Normally, the paediatric department assist with providing staff for the emergency centre and non-specialist physicians from the paediatric department have been the treating clinician for around 40% of acute paediatric presentations. Since the lockdown measures came in to effect, the paediatric department has been responsible for over 90% of acute paediatric presentations to free up emergency centre staff to assist with the adult workload. This was made possible by closing the paediatric out patient department and reverting to telephonic consultations that needed less staff.

An electronic patient tracking and registration database (HECTIS - Hospital and Emergency Centre Tracking Information System) is used to collect routine clinical data for each patient that is managed within the emergency centre.

HECTIS is an official electronic application of the Western Cape Department of Health which follows the flow of patients in an emergency centre from arrival to discharge or admission. It is used by numerous emergency centres to streamline patient processes and capture data related to process times, triage scores, ICD-10 (International Statistical Classification of Diseases and Related Health Problems 10th Revision) diagnoses and dispositions. The database has been built on an Oracle platform and is stored off-site. The database is access controlled and authorised users are granted access and authorisation according to their specific clinical role. A triage nurse will thus have access to different parts of the database than a clinician in the emergency centre.

Study participants

Convenience sampling was used to include all patients <13 years of age that presented to the emergency centre of Mitchells Plain Hospital over the study periods. Time periods included the level 5 lockdown period (27 March 2020 till 30 April 2020), a 5-week period immediately before the lockdown (21 February 2020 – 26 March 2020), a 5-week period immediately after the lockdown (01 May 2020 – 04 June 2020) and corresponding periods during 2018 and 2019.

Data collection and management

Data were exported from the HECTIS database for the various study periods. Variables included age, gender, mode of transport, type of presentation, triage category, ICD-10 diagnosis, process times, and disposition. The triage category was determined at arrival to the hospital and patients were categorised into emergency (red), very urgent (orange), urgent (yellow), and non-urgent (green) as stipulated by the South African Triage Scale (SATS).[16] Patients' diagnosis was determined from ICD-10 codes documented as the main diagnosis. Disposition refers to where a patient is being discharged from the emergency centre. Patient process times were calculated from electronic timestamps and included time to triage (arrival at emergency centre to time of triage), time to consultation (arrival at emergency centre to time seen by physician), time to disposition (arrival at emergency centre to time when emergency centre disposition was decided) and time in emergency centre (arrival at emergency centre to time when patient left the emergency centre). Process times of patients that absconded were only included to calculate the time to triage (if a triage time was documented) and were excluded from the other process times.

Statistical analysis

Summary statistics were used to describe all variables. Categorical data are summarised using frequency counts and percentages, and are presented as two-way tables or bar charts. Median was used as the measure of central tendency for continuous responses and quartiles as indicators of spread. The relationship between categorical variables was determined with the Chi-square test or the Fisher's Exact test, and process times were compared with the independent samples median test. A 5% significance level was used and data were analysed using SPSS Statistics for Windows, Version 26.0 (IBM Corp. Released 2019. Armonk, NY: IBM Corp.).

Patient and Public Involvement Statement

This research was done without patient involvement. Patients were not invited to comment on the study design and were not consulted to develop patient relevant outcomes or interpret the results. Patients were not invited to contribute to the writing or editing of this document for readability or accuracy.

RESULTS

Overall emergency centre visits

A total of 39 905 emergency centre visits were documented over the study periods, of which 9 983 were younger than 13 years of age (a 15% reduction in all (adult and paediatric) emergency centre visits compared to 2019 was observed, as well as a 35% reduction over the lockdown period).[17] One patient was excluded as the visit only pertained to special investigations; 9 982 were thus analysed. There were 2 464 paediatric emergency centre visits during the 2020 time periods, 1 601 less than in 2019 (n=4065) and 989 less than in 2018 (n=3453). There was a 6.2% (n=78) increase in the actual number of patients seen during the 2020 pre-lockdown period compared to 2019, followed by a 58.1% (n=821) reduction for the level 5 lockdown periods and a 61.8% (n=858) reduction over the post-lockdown periods (Figure 1).

Demographics and characteristics

The demographics and characteristics of patients whom presented during 2020 are presented in Table 1 (see supplementary table 1 for data pertaining to 2018 and 2019). Significant differences during level 5 lockdown compared to the 2020 pre-lockdown period were seen in patient's age, referral type, triage category and disposition. The proportion of children younger than 1 year increased by 10.4% ($p<0.001$), with a decrease in the 1 to 5 year group (5.6%, $p=0.022$) and in patients over the age of 5 years (4.8%, $p=0.02$). The proportions in the age category changed as lockdown measures were eased; children over 5 years were the only group showing an increase (7.1%, $p=0.005$). An increase in the proportion of self referrals occurred (7.4%, $p<0.001$), with a subsequent decrease in referrals from primary healthcare clinics (6.9%, $p<0.001$) and general practitioners (0.4%, $p=0.754$). Children presenting during the level 5 lockdown periods were also sicker with a 2% increase in the proprotion of emergency (triaged red) cases ($p=0.018$), although the actual number of patients decreased (n=5). The difference in triage category most likely contributed to the proportional increase of inpatient referrals (5.6%, $p=0.001$), as well as patients referred for higher level of care (3.9%, $p=0.004$). This also resulted in a proportional decrease in patients being discharged directly home from the emergency centre (5.6%, $p=0.019$).

Table 1. Demographics and characteristics of paediatric patients presenting to the emergency centre during the level 5 COVID-19 lockdown period and corresponding 5-week periods immediately before and after the lockdown.

Variables n (%)		21 February – 26 March (Pre-lockdown)	27 March – 30 April (Level 5 lockdown)	01 May – 04 June (Post-lockdown)
Age (year)	<1	243 (18.1%)	169 (28.5%)[a]	116 (21.9%)[b]
	1-5	787 (58.6%)	314 (53%)[a]	279 (52.6%)
	>5	312 (23.2%)	109 (18.4%)[a]	135 (25.5%)[b]
Gender	Female	565 (42.1%)	267 (45.1%)	251 (47.4%)
	Male	777 (57.9%)	325 (54.9%)	279 (52.6%)
Transport method	Self	1115 (83.1%)	489 (82.6%)	476 (89.8%)[b]
	Ambulance	145 (10.8%)	69 (11.7%)	52 (9.8%)
	Police or Fire service	0 (0%)	0 (0%)	0 (0%)
	Unknown	82 (6.1%)	34 (5.7%)	2 (0.4%)[b]
Arrival from	Scene / home	1000 (74.5%)	485 (81.9%)[a,c]	457 (86.2%)[d]
	Other healthcare facility	260 (19.4%)	74 (12.5%)[a,c]	52 (9.8%)[d]
	General Practitioner	81 (6%)	33 (5.6%)	21 (4%)[d]
	Unknown	1 (0.1%)	0 (0%)	0 (0%)
Triage category	Non-urgent (Green)	344 (25.6%)	142 (24%)	172 (32.5%)[b,d]
	Urgent (Yellow)	663 (49.4%)	300 (50.7%)	256 (48.3%)
	Very urgent (Orange)	267 (19.9%)	115 (19.4%)	78 (14.7%)[b,d]
	Emergency (Red)	30 (2.2%)	25 (4.2%)[a]	17 (3.2%)
	Unknown	38 (2.8%)	10 (1.7%)	7 (1.3%)
Disposition	Death	4 (0.3%)	4 (0.7%)	0 (0%)
	Referred to in-hospital disciplines	163 (12.1%)[e]	105 (17.7%)[a]	91 (17.2%)[d]
	Discharged	871 (64.9%)	351 (59.3%)[a,c]	346 (65.3%)[b,d]
	Absconded	160 (11.9%)[e]	33 (5.6%)[a]	13 (2.5%)[b,d]
	Transferred to higher level facility	92 (6.9%)	64 (10.8%)[a,c]	65 (12.3%)[d]
	Refer to other	52 (3.9%)[e]	35 (5.9%)	15 (2.8%)[b]

[a] Statistically significant difference (p<0.05) between pre-lockdown period 2020 and level 5 lockdown period 2020 (see supplementary table 2)
[b] Statistically significant difference (p<0.05) between level 5 lockdown period 2020 and post-lockdown period 2020 (see supplementary table 2)
[c] Statistically significant difference (p<0.05) between level 5 lockdown period 2019 and 2020 (see supplementary table 2)
[d] Statistically significant difference (p<0.05) between post-lockdown period 2019 and 2020 (see supplementary table 2)
[e] Statistically significant difference (p<0.05) between pre-lockdown period 2019 and 2020 (see supplementary table 2)

Diagnostic categories

The top three diagnostic categories during the level 5 lockdown were related to the respiratory system (n=141, 23.8%), injuries and poisonings (n=133, 22.5%), and infectious diseases (n=110, 18.6%). In the different age groups, infectious diseases were most frequent in the under 1 year group (n=52, 30.8%), respiratory-related diseases in the 1-5 year group (n=84, 26.8%), and injury-related presentations in the

over 5 year group (n=46, 14.6%) (Table 2). The top five diagnostic categories per age group and per time period is presented in Supplementary table 3. The actual number of presentations during the level 5 lockdown decreased in all the diagnostic categories compared to the 2020 pre-lockdown period (Table 3). Significant reductions occurred in respiratory diseases (n=285, 66.9%, p<0.001), injuries (n=75, 36.1%, p<0.001), and infectious and parasitic diseases (n=57, 34.1%, p<0.001). Proportionally, diseases of the respiratory system decreased by 7.9%, infectious-related diseases increased by 6.2%, and injuries increased by 7.0% (Table 3) (see supplementary table 4 for comparisons of 2020 versus 2019 and 2020 versus 2018). The diagnostic categories for all the time periods are presented in supplementary table 5. In admitted patients, actual infectious-related diseases decreased by 40% (n=24) and diseases of the respiratory system by 63% (n=67) during the lockdown period compared to 2019. A 28% (n=14) reduction was seen in actual infectious-related and respiratory-related diseases comparing the 2020 lockdown periods (see supplementary table 6 for the diagnostic categories of admitted patients). In patients transferred to higher level of care, actual infectious-related diseases increased by 91% (n=10) and injuries by 33% (n=4) during the lockdown period compared to 2019. A 30% (n=7) reduction was seen in the actual number of injuries and a 5% (n=1) increase in infectious-related diseases comparing the 2020 lockdown periods (see supplementary table 7 for the diagnostic categories of transferred patients).

Table 2. Top five diagnostic categories per age group presenting to the emergency centre during the level 5 COVID-19 lockdown period.

All			<1 year			1-5 year			> 5 year		
Rank	**ICD-10 Category**	**N (%)**	**Rank**	**ICD-10 Category**	**n (%)**	**Rank**	**ICD-10 Category**	**n (%)**	**Rank**	**ICD-10 Category**	**n (%)**
1	Respiratory system	141 (23.8)	1	Infectious diseases	52 (30.8)	1	Respiratory system	84 (26.8)	1	Injury and poisoning	46 (14.6)
2	Injury and poisoning	133 (22.5)	2	Respiratory system	43 (25.4)	2	Injury and poisoning	79 (25.2)	2	Respiratory system	14 (4.5)
3	Infectious diseases	110 (18.6)	3	Findings, not elsewhere classified	13 (7.7)	3	Infectious diseases	47 (15.0)	3	Infectious diseases	11 (3.5)
4	Nervous system	30 (5.1)	4	Skin and subcutaneous tissue	11 (6.5)	4	Nervous system	16 (5.1)	4	Nervous system	10 (3.2)
5	Skin and subcutaneous tissue	26 (4.4)	5	Injury and poisoning	8 (4.7)	5	Ear and mastoid process	14 (4.5)	5	Digestive system	5 (1.6)

ICD-10: International Statistical Classification of Diseases and Related Health Problems, 10th revision

Table 3. Actual and proportional differences of paediatric presentations to the emergency centre during the level 5 lockdown period, compared to similar 5-week periods before and after.

	21 February – 26 March (Pre-lockdown) vs 27 March – 30 April (Level 5 lockdown)			27 March – 30 April (Level 5 lockdown) vs 01 May – 04 June (Post-lockdown)		
ICD-10 category	**Actual n (%)**	**Proportional**	**p**	**Actual n (%)**	**Proportional**	**p**
I Certain infectious and parasitic diseases	-57 (-34.1)	6.2%	***<0.001***	-40 (-36.4)	-5.4%	***0.015***
VI Diseases of the nervous system	-12 (-28.6)	2.0%	0.050	-14 (-46.7)	-2.1%	0.097
VIII Diseases of the ear and mastoid process	-43 (-66.2)	-1.1%	0.287	-8 (-36.4)	-1.1%	0.316
X Diseases of the respiratory system	-285 (-66.9)	-7.9%	***<0.001***	-7 (-5.0)	1.5%	0.579
XI Diseases of the digestive system	-17 (-60.7)	-0.2%	0.861	13 (118.2)	2.6%	0.015
XII Diseases of the skin and subcutaneous tissue	-23 (-46.9)	0.7%	0.445	-2 (-7.7)	0.1%	1.000
XIV Diseases of the genitourinary system	-26 (-65.0)	-0.6%	0.462	-2 (-14.3)	-0.1%	1.000
XVIII Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	-64 (-71.9)	-2.4%	***0.046***	6 (24.0)	1.6%	0.220
XIX Injury, poisoning and certain other consequences of external causes	-75 (-36.1)	7.0%	***<0.001***	20 (15.0)	6.4%	***0.016***

Process times

All process times were significantly different between the various study periods (Table 4). Comparing median times between the level 5 lockdown period and the 2020 pre-lockdown period, time to triage decreased by 7 minutes ($p<0.001$), time to consultation by 91 minutes ($p<0.001$), time to deciding disposition by 76 minutes ($p<0.001$), and length of stay within the emergency centre by 41 minutes ($p=0.003$).

Table 4. Process times for paediatric patients (n=9308) presenting to the emergency centre during the 5-week COVID-19 level 5 lockdown period and corresponding periods for three years prior to the lockdown.

	2018			2019			2020			p
Process times (minutes), median(Q1-Q3)* [maximum]	**21 February – 26 March**	**27 March – 30 April**	**01 May – 04 June**	**21 February – 26 March**	**27 March – 30 April**	**01 May – 04 June**	**21 February – 26 March (Pre-lockdown)**	**27 March – 30 April (Level 5 lockdown)**	**01 May – 04 June (Post-lockdown)**	
Time to triage	12 (5-31) [581]	15 (4-39) [803]	20 (7-47) [460]	19 (6-47) [612]	22 (7-52) [565]	16 (5-43) [368]	19 (6-49) [665]	12 (4-33) [308]	14 (5-34) [1461]	<0.001
Time to consultation	81 (45-132) [1067]	95 (54-159) [905]	104 (59-171) [1222]	107 (61-187) [654]	119 (66-214) [742]	118 (65-208) [685]	140 (71-235) [872]	49 (42-122) [590]	59 (29-101) [1054]	<0.001
Time to disposition decision	146 (94-216) [1437]	157 (99-242) [1146]	160 (106-246) [1291]	190 (121-295) [1521]	193 (121-314) [1506]	191 (112-291) [1026]	245 (156-365) [3337]	169 (95-267) [1918]	123 (70-204) [1773]	<0.001
Time in emergency centre	188 (126-278) [1438]	205 (129-320) [1797]	207 (130-330) [3800]	274 (165-495) [2043]	262 (146-428) [1717]	251 (142-411) [2632]	311 (200-492) [3353]	270 (153-459) [2349]	164 (85-423) [1984]	<0.001

*Q1-Q3: 25th to 75th percentile

DISCUSSION

The volume of children visiting the emergency centre during and after the level 5 lockdown period was significantly lower than similar previous time periods. Significant reductions in the number of presentations were seen in respiratory diseases, infectious diseases and injuries (Table 3). A reduction in the proportion of diseases related to the respiratory system occurred in all age groups, while infectious diseases increased in younger patients (<1 year) and injuries increased in children older than one year.

The overall reduction in paediatric emergency centre visits is similar to experiences from the SARS and MERS pandemics, as people tend to avoid or delay attending hospitals due to the fear of contracting the communicable disease.[9–11] Anecdotal evidence do suggest that attendance to the primary healthcare services also decreased. This is of concern and child health needs to be monitored closely over the coming 12 months. The likely reduction in immunisations, specifically measles, could result in outbreaks of non-COVID-19 communicable diseases causing more morbidity and mortality.[3] The impact of this would be substantially worse in impoverished communities.

The reduction in respiratory and infectious-related diseases were substantial contributors to the overall reduction in emergency centre attendance, although the proportion of children with infectious diseases increased. These reductions are most likely multifactorial, and one important consideration could be the closing of early childhood development centres. It has been well documented that children attending crèches have a higher incidence of infectious diseases, including respiratory tract infections.[18,19] About three quarters of paediatric emergency centre attendees at Mitchells Plain Hospital are children under the age of 5 years, of whom a large proportion will normally be in formal or informal crèches while their parents work. The lockdown measures forced most parents to stay at home, thereby further reducing children's exposure to infections (COVID-19 and other) as trips to shops or work were limited.

Children presenting with injuries and poisoning decreased by a third during the level 5 lockdown period, but increased proportionally by 7% (Table 3). This was not expected and could be from children bypassing the community healthcare centres; thus children with minor injuries also presented to the hospital. On the other hand, the home is one of the most dangerous places for children. It is estimated that around 90% of unintentional injuries in young children occur in or around their home when they are supposedly being supervised by a caregiver.[20] Injury risk could also have increased if children became bored at home, while parents were most likely frustrated in the constant supervision of the children. Furthermore, anecdotal evidence suggest that the number of child abuse cases did not decrease during the lockdown periods and remain on a similar trend than before.[21] Another possible reason is the longstanding problem in South Africa where many children are looking after themselves and other children, with an understandable lack of adequate supervision.

The main strength of the study is the use of a comprehensive database that is completed in real time. Although data are not cross-checked, we expect the data to be adequately reflecting the truth. However, care should be taken to generalise the results of the study to other healthcare facilities as it reflects a

single centre in a fairly distinctive setting. Diseases were categorised according to diagnostic codes (ICD-10) assigned by attending physicians. A diagnostic code was not assigned to around 10% of patients. We also did not validate whether the correct diagnosis were made, neither did we attempt to ensure that the correct diagnostic code were assigned to the diagnosis. This could have resulted in non-systematic error.

CONCLUSION

Significantly less children presented to the emergency centre since the implementation of the national COVID-19 level 5 lockdown. The closure of early childhood development centres and schools, together with the restriction of movement of children and their caregivers, markedly reduced the infectious and respiratory-related component of paediatric attendees. The burden of injuries in resource-limited societies remains a problem, even during a period of national lockdown. However, the change in paediatric presentations to the emergency centre across all COVID-19 lockdown levels remains unknown and should be investigated in future.

CONTRIBUTIONS

DJvH and CH conceived the study. MA, CH, and KE undertook data collection. MA and DJvH cleaned the data, and DJvH and CH did the data analyses. MA drafted the manuscript and the remaining authors critiqued the paper for important intellectual content. All authors read and approved the final version of the manuscript. MA is the guarantor.

FUNDING

The study was self-funded.

COMPETING INTERESTS

None declared.

ETHICS APPROVAL

The study was approved by the Health Research Ethics Committee of Stellenbosch University (Ref: N20/04/009_COVID-19) and included a waiver of informed consent.

FIGURE CAPTIONS

Figure 1. Number of paediatric emergency centre visits over a 5-week period before, during and after the COVID-19 level 5 lockdown.

WHAT IS ALREADY KNOWN ON THIS TOPIC

- The volume of children attending emergency centres varied during previous epidemics
- Paediatric emergency centre attendances decreased during COVID-19

WHAT THIS STUDY ADDS

- Significantly less children presented to the emergency centre since the implementation of national COVID-19 level 5 lockdown
- A greater proportion, but smaller numbers of younger and sicker children attended the emergency centre during the COVID-19 lockdown
- Marked reductions occurred in respiratory diseases, infectious-related diseases, and in injuries
- The proportion of infectious diseases increased in patients <1 year, while injuries increased in older children

REFERENCES

1 Krug SE, Bojko T, Dolan MA, *et al.* Access to Optimal Emergency Care for Children. *Pediatrics* 2007;**119**:161–4. doi:10.1542/peds.2006-2900

2 Quaglio G, Pizzol D, Bome D, *et al.* Maintaining Maternal and Child Health Services During the Ebola Outbreak: Experience from Pujehun, Sierra Leone. *PLoS Curr* 2016;**8**. doi:10.1371/currents.outbreaks.d67aea257f572201f835772d7f188ba5

3 World Health Organization. Vaccination In Acute Humanitarian Emergencies. Geneva: 2017. https://www.who.int/immunization/documents/who_ivb_17.03/en/ (accessed 20 Jun 2020).

4 World Health Organization. WHO Timeline - COVID-19. 2020.https://www.who.int/news-room/detail/27-04-2020-who-timeline---covid-19 (accessed 20 Jun 2020).

5 COVID-19 Risk Adjusted Strategy - SA Corona Virus Online Portal. https://sacoronavirus.co.za/covid-19-risk-adjusted-strategy/ (accessed 2 Sep 2020).

6 Torres JP, O'Ryan M, Herve B, *et al.* Impact of the novel influenza A (H1N1) during the 2009 autumn-winter season in a large hospital setting in Santiago, Chile. *Clin Infect Dis* 2010;**50**:860–8. doi:10.1086/650750

7 Kwan-Gett TS, Baer A, Duchin JS. Spring 2009 H1N1 influenza outbreak in King Country Washington. *Disaster Med Public Health Prep* 2009;**3**. doi:10.1097/DMP.0b013e3181c6b818

8 Falconer E, Keddy M, Milne WK. Impact of the H1N1 influenza pandemic in two rural emergency departments. 2012;**12**. doi:10.22605/RRH2063

9 Lee SY, Khang YH, Lim HK. Impact of the 2015 middle east respiratory syndrome outbreak on emergency care utilization and mortality in South Korea. *Yonsei Med J* 2019;**60**:796–803. doi:10.3349/ymj.2019.60.8.796

10 Paek SH, Kim DK, Lee JH, *et al.* The impact of middle east respiratory syndrome outbreak on trends in emergency department utilization patterns. *J Korean Med Sci* 2017;**32**:1576–80. doi:10.3346/jkms.2017.32.10.1576

11 Huang H-H, Yen DH-T, Kao W-F, *et al.* Declining emergency department visits and costs during the severe acute respiratory syndrome (SARS) outbreak. *J Formos Med Assoc* 2006;**105**:31–7. doi:10.1016/S0929-6646(09)60106-6

12 Morris D, Rogers M, Kissmer N, *et al.* Impact of lockdown measures implemented during the Covid-19 pandemic on the burden of trauma presentations to a regional emergency department in Kwa-Zulu Natal, South Africa. *African J Emerg Med* Published Online First: 16 June 2020. doi:10.1016/j.afjem.2020.06.005

13 Statistics South Africa. Mitchells Plain. http://www.statssa.gov.za/?page_id=4286&id=329. (accessed 17 Apr 2020).

14 Statistics South Africa. Philippi. http://www.statssa.gov.za/?page_id=4286&id=323 (accessed 17 Apr 2020).

15 Mitchell's Plain Nodal Economic Development Profile Western Cape. https://mitchellsplain.files.wordpress.com/2011/07/mitchells_20plain_20narrative.pdf

16 South African Triage Group. The South African Triage Scale (SATS). 2012.https://emssa.org.za/special-interest-groups/the-south-african-triage-scale-sats/ (accessed 28 Aug 2019).

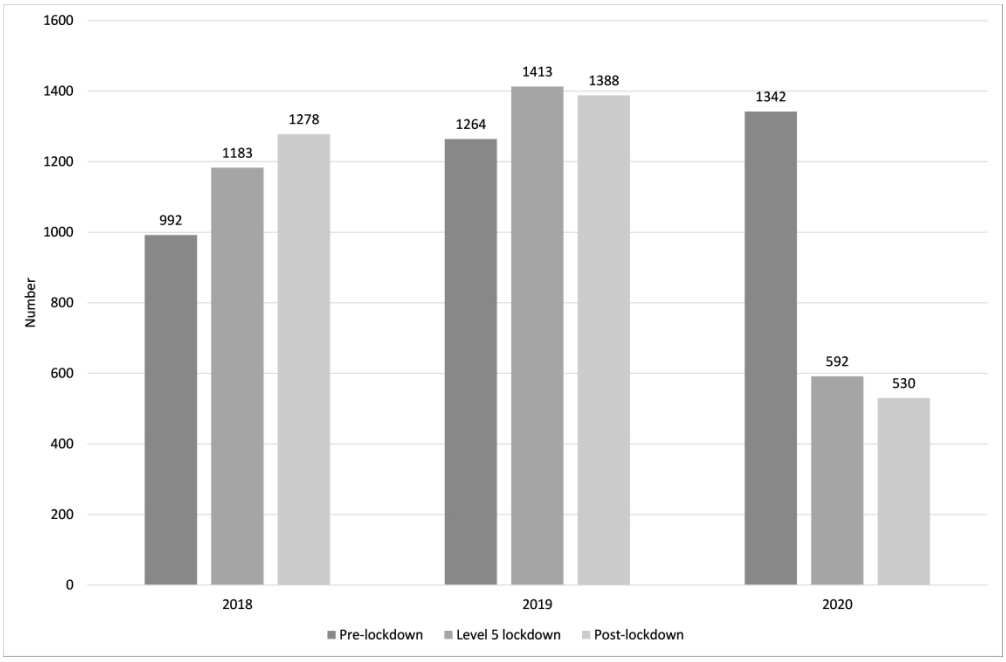
17 Hendrikse C, Parak M, van Hoving DJ. A descriptive analysis of the effect of the national COVID-19 lockdown on the workload and case mix of patients presenting to a district-level emergency centre in Cape Town, South Africa. *S Afr Med J*

18 Kamper-Jørgensen M, Wohlfahrt J, Simonsen J, *et al.* Population-based study of the impact of childcare attendance on hospitalizations for acute respiratory infections. *Pediatrics* 2006;**118**:1439–46. doi:10.1542/peds.2006-0373

19 Lu N, Samuels ME, Shi L, *et al.* Child day care risks of common infectious diseases revisited. *Child Care Health Dev* 2004;**30**:361–8. doi:10.1111/j.1365-2214.2004.00411.x

20 World Health Organization. World report on child injury prevention. Geneva: : World Health Organization 2015. https://www.who.int/violence_injury_prevention/child/injury/world_report/en/ (accessed 22 Jun 2020).

21 Cleary K. Fear, sadness and anger: The hidden impact of lockdown on children. City Press. 2020.https://www.news24.com/citypress/News/fear-sadness-and-anger-the-hidden-impact-of-lockdown-on-children-20200527 (accessed 23 Jun 2020).



258x168mm (500 x 500 DPI)

Supplementary table 1. Demographics and characteristics of paediatric patients presenting to the emergency centre during the level 5 COVID-19 lockdown period and corresponding 5-week periods immediately before and after the lockdown and for two previous years.

		2018			2019			2020		
Variables n (%)		**21 Feb – 26 Mar**	**27 Mar – 30 Apr**	**01 May – 04 Jun**	**21 Feb – 26 Mar**	**27 Mar – 30 Apr**	**01 May – 04 Jun**	**21 Feb – 26 Mar (Pre-lockdown)**	**27 Mar – 30 Apr (Level 5 lockdown)**	**01 May – 04 Jun (Post-lockdown)**
Age (year)	<1	210 (21.2%)	372 (31.4%)	368 (28.8%)	249 (19.7%)	351 (24.8%)	312 (22.5%)	243 (18.1%)	169 (28.5%)[a]	116 (21.9%)[b]
	1-5	528 (53.2%)	592 (50%)	677 (53%)	717 (56.7%)	766 (54.2%)	742 (53.5%)	787 (58.6%)	314 (53%)[a]	279 (52.6%)
	>5	254 (25.6%)	219 (18.5%)	233 (18.2%)	298 (23.6%)	296 (20.9%)	334 (24.1%)	312 (23.2%)	109 (18.4%)[a]	135 (25.5%)[b]
Gender	Female	436 (44%)	509 (43%)	588 (46%)	537 (42.5%)	609 (43.1%)	610 (43.9%)	565 (42.1%)	267 (45.1%)	251 (47.4%)
	Male	556 (56%)	674 (57%)	690 (54%)	727 (57.5%)	804 (56.9%)	778 (56.1%)	777 (57.9%)	325 (54.9%)	279 (52.6%)
Transport method	Self	785 (79.1%)	920 (77.8%)	1082 (84.7%)	1025 (81.1%)	1171 (82.9%)	1267 (91.3%)	1115 (83.1%)	489 (82.6%)	476 (89.8%)[b]
	Ambulance	130 (13.1%)	178 (15%)	193 (15.1%)	152 (12%)	133 (9.4%)	120 (8.6%)	145 (10.8%)	69 (11.7%)	52 (9.8%)
	Police or Fire service	2 (0.2%)	1 (0.1%)	1 (0.1%)	2 (0.2%)	4 (0.3%)	1 (0.1%)	0 (0%)	0 (0%)	0 (0%)
	Unknown	75 (7.6%)	84 (7.1%)	2 (0.2%)	85 (6.7%)	105 (7.4%)	0 (0%)	82 (6.1%)	34 (5.7%)	2 (0.4%)[b]
Arrival from	Scene / home	658 (66.3%)	835 (70.6%)	907 (71%)	931 (73.7%)	1069 (75.7%)	1067 (76.9%)	1000 (74.5%)	485 (81.9%)[a,c]	457 (86.2%)[d]
	Other healthcare facility	262 (26.4%)	266 (22.5%)	285 (22.3%)	250 (19.8%)	242 (17.1%)	220 (15.9%)	260 (19.4%)	74 (12.5%)[a,c]	52 (9.8%)[d]
	General Practitioner	72 (7.3%)	82 (6.9%)	86 (6.7%)	83 (6.6%)	99 (7%)	101 (7.3%)	81 (6%)	33 (5.6%)	21 (4%)[d]
	Unknown	0 (0%)	0 (0%)	0 (0%)	0 (0%)	3 (0.2%)	0 (0%)	1 (0.1%)	0 (0%)	0 (0%)
Triage category	Non-urgent (Green)	238 (24%)	202 (17.1%)	202 (15.8%)	311 (24.6%)	287 (20.3%)	241 (17.4%)	344 (25.6%)	142 (24%)	172 (32.5%)[b,d]
	Urgent (Yellow)	516 (52%)	622 (52.6%)	760 (59.5%)	639 (50.6%)	758 (53.6%)	733 (52.8%)	663 (49.4%)	300 (50.7%)	256 (48.3%)
	Very urgent (Orange)	181 (18.2%)	286 (24.2%)	255 (20%)	246 (19.5%)	294 (20.8%)	351 (25.3%)	267 (19.9%)	115 (19.4%)	78 (14.7%)[b,d]
	Emergency (Red)	33 (3.3%)	41 (3.5%)	35 (2.7%)	39 (3.1%)	40 (2.8%)	35 (2.5%)	30 (2.2%)	25 (4.2%)[a]	17 (3.2%)
	Unknown	24 (2.4%)	32 (2.7%)	26 (2%)	29 (2.3%)	34 (2.4%)	28 (2%)	38 (2.8%)	10 (1.7%)	7 (1.3%)
Disposition	Death	2 (0.2%)	0 (0%)	1 (0.1%)	1 (0.1%)	4 (0.3%)	3 (0.2%)	4 (0.3%)	4 (0.7%)	0 (0%)
	Referred to in-hospital disciplines	193 (19.5%)	251 (21.2%)	293 (22.9%)	210 (16.6%)	209 (14.8%)	159 (11.5%)	163 (12.1%)[e]	105 (17.7%)[a]	91 (17.2%)[d]
	Discharged	674 (67.9%)	770 (65.1%)	817 (63.9%)	862 (68.2%)	946 (66.9%)	983 (70.8%)	871 (64.9%)	351 (59.3%)[a,c]	346 (65.3%)[b,d]
	Absconded	28 (2.8%)	42 (3.6%)	58 (4.5%)	66 (5.2%)	99 (7%)	92 (6.6%)	160 (11.9%)[e]	33 (5.6%)[a]	13 (2.5%)[b,d]
	Transferred to higher level facility	58 (5.8%)	86 (7.3%)	62 (4.9%)	101 (8%)	90 (6.4%)	87 (6.3%)	92 (6.9%)	64 (10.8%)[a,c]	65 (12.3%)[d]
	Refer to other	37 (3.7%)	34 (2.9%)	47 (3.7%)	24 (1.9%)	65 (4.6%)	64 (4.6%)	52 (3.9%)[e]	35 (5.9%)	15 (2.8%)[b]

[a] Statistically significant difference ($p<0.05$) between pre-lockdown period 2020 and level 5 lockdown period 2020 (see supplementary table 2)

[b] Statistically significant difference ($p<0.05$) between level 5 lockdown period 2020 and post-lockdown period 2020 (see supplementary table 2)

[c] Statistically significant difference ($p<0.05$) between level 5 lockdown period 2019 and 2020 (see supplementary table 2)

[d] Statistically significant difference ($p<0.05$) between post-lockdown period 2019 and 2020 (see supplementary table 2)

[e] Statistically significant difference ($p<0.05$) between pre-lockdown period 2019 and 2020 (see supplementary table 2)

Supplementary table 2. Differences between different study periods of demographic and clinical characteristics of paediatric patients presenting to the emergency centre

	2020 vs 2019						2020			
	21 Feb – 26 Mar		27 Mar – 30 Apr		01 May – 04 Jun		Pre-lockdown vs Level 5 lockdown		Level 5 lockdown vs Post-lockdown	
Variables n (%)	**n (%)**	**p**	**n (%)**	**p**	**n (%)**	**p**	**n (%)**	**p**	**n (%)**	**p**
Age (year)										
<1	-6 (-2.4)	0.317	-182 (-51.9)	0.094	-196 (-62.8)	0.806	-74 (-30.5)	<0.001	-53 (-31.4)	0.011
1-5	70 (9.7)	0.322	-452 (-59.0)	0.659	-463 (-62.4)	0.759	-473 (-60.1)	0.022	-35 (-11.1)	0.905
>5	14 (4.)	0.853	-187 (-63.2)	0.201	-199 (-59.6)	0.553	-203 (-65.1)	0.020	26 (23.9)	0.005
Gender										
Female	28 (5.2)	0.874	-342 (-56.2)	0.430	-359 (-58.9)	0.182	-298 (-52.7)	0.232	-16 (-6.0)	0.472
Male	50 (6.9)	0.000	-479 (-59.6)		-499 (-64.1)	0.000	-452 (-58.2)	0.000	-46 (-14.2)	0.000
Transport method										
Self	90 (8.8)	0.201	-682 (-58.2)	0.897	-791 (-62.4)	0.330	-626 (-56.1)	0.844	-13 (-2.7)	0.001
Ambulance	-7 (-4.6)	0.355	-64 (-48.1)	0.143	-68 (-56.7)	0.475	-76 (-52.4)	0.637	-17 (-24.6)	0.336
Police or Fire service	-2 (-100)	0.235	-4 (-100)	0.326	-1 (-100)	1.000	0 (0)	---	0 (0)	---
Unknown	-3 (-3.5)	0.575	-71 (-67.6)	0.179	2 (200)	0.076	-48 (-58.5)	0.758	-32 (-94.1)	<0.001
Arrival from										
Scene / home	69 (7.4)	0.623	-584 (-54.6)	0.002	-610 (-57.2)	<0.001	-515 (-51.5)	<0.001	-28 (-5.8)	0.051
Other healthcare facility	10 (4)	0.805	-168 (-69.4)	0.011	-168 (-76.4)	0.001	-186 (-71.5)	<0.001	-22 (-29.7)	0.157
General Practitioner	-2 (-2.4)	0.628	-66 (-66.7)	0.277	-80 (-79.2)	0.009	-48 (-59.3)	0.754	-12 (-36.4)	0.213
Unknown	1 (100)	1.000	-3 (-100)	0.560	0 (0)	---	-1 (-100)	1.000	0 (0)	---
Triage category										
Non-urgent (Green)	33 (10.6)	0.557	-145 (-50.5)	0.073	-69 (-28.6)	<0.001	-202 (-58.2)	0.460	-30 (-14.2)	0.002
Urgent (Yellow)	24 (3.7)	0.292	-458 (-60.4)	0.239	-477 (-65.1)	0.082	-363 (-58.7)	0.622	-44 (-21.1)	0.437
Very urgent (Orange)	21 (8.5)	0.805	-179 (-60.9)	0.504	-273 (-77.8)	<0.001	-152 (-54.8)	0.853	-37 (-14.7)	0.039
Emergency (Red)	-9 (-23.1)	0.182	-15 (-37.5)	0.128	-18 (-51.4)	0.432	-5 (-56.9)	0.018	-8 (-32.2)	0.432
Unknown	9 (31.0)	0.458	-24 (-70.6)	0.404	-21 (-75)	0.347	-28 (-73.7)	0.155	-3 (-30)	0.636
Disposition										
Referred to in-hospital disciplines	3 (300)	0.376	0 (0)	0.246	-3 (-100)	0.565	0 (0)	0.258	-4 (-100)	0.127
Discharged	-47 (-22.4)	0.001	-104 (-49.8)	0.106	-68 (-42.8)	0.001	-58 (-35.6)	0.001	-14 (-13.3)	0.814
Absconded	9 (1.0)	0.081	-595 (-62.9)	0.001	-637 (-64.8)	0.020	-520 (-59.7)	0.019	-5 (-1.4)	0.042
Transferred to higher level facility	94 (142.4)	0.001	-66 (-66.7)	0.277	-79 (-85.9)	0.001	-127 (-79.4)	0.001	-20 (-60.6)	0.010
Refer to other	-9 (-8.9)	0.295	-26 (-28.9)	0.001	-22 (-25.3)	<0.001	-28 (-30.4)	0.004	1 (1.6)	0.455
Referred to in-hospital disciplines	28 (116.7)	0.003	-30 (-46. 2)	0.260	-49 (-76.6)	0.094	-17 (-32.7)	0.056	-20 (-57.1)	0.014

Pre-lockdown period: 21 February – 26 March; Lockdown period: 27 March – 30 April; Post-lockdown period: 01 May – 04 June

Supplementary table 3. Top five diagnostic categories per age group presenting to the emergency centre during the level 5 COVID-19 lockdown period and similar time periods.

27 March – 30 April 2019		21 February – 26 March 2020 (Pre-lockdown)		27 March – 30 April 2020 (level 5 lockdown)		01 May – 04 June 2020 (Post-lockdown)	
ICD-10 Category	**n (%)**	**ICD-10 Category**	**n (%)**	**ICD-10 Category**	**n (%)**	**ICD-10 Category**	**n (%)**
All							
Respiratory system	442 (35.0)	Respiratory system	426 (31.7)	Respiratory system	141 (23.8)	Injury and poisoning	153 (28.9)
Infectious diseases	247 (19.5)	Injury and poisoning	208 (15.5)	Injury and poisoning	133 (22.5)	Respiratory system	134 (25.3)
Injury and poisoning	209 (16.5)	Infectious diseases	167 (12.4)	Infectious diseases	110 (18.6)	Infectious diseases	70 (13.2)
Findings, not elsewhere classified	51 (4.0)	Findings, not elsewhere classified	89 (6.6)	Nervous system	30 (5.1)	Findings, not elsewhere classified	31 (5.8)
Nervous system	49 (3.9)	Ear and mastoid process	65 (4.8)	Skin and subcutaneous tissue	26 (4.4)	Digestive system	24 (4.5)
						Skin and subcutaneous tissue	24 (4.5)
<1 year							
Respiratory system	200 (57.0)	Respiratory system	78 (32.1)	Infectious diseases	52 (30.8)	Infectious diseases	33 (28.4)
Infectious diseases	65 (18.5)	Infectious diseases	61 (25.1)	Respiratory system	43 (25.4)	Respiratory system	29 (25.0)
Findings, not elsewhere classified	11 (3.1)	Findings, not elsewhere classified	20 (8.2)	Findings, not elsewhere classified	13 (7.7)	Injury and poisoning	13 (11.2)
Injury and poisoning	10 (2.8)	Injury and poisoning	18 (7.4)	Skin and subcutaneous tissue	11 (6.5)	Skin and subcutaneous tissue	9 (7.8)
Skin and subcutaneous tissue	7 (2.0)	Skin and subcutaneous tissue	10 (4.1)	Injury and poisoning	8 (4.7)	Digestive system	6 (5.2)
Ear and mastoid process	7 (2.0)						
1-5 year							
Respiratory system	294 (38.4)	Respiratory system	284 (36.1)	Respiratory system	84 (26.8)	Injury and poisoning	93 (33.3)
Infectious diseases	125 (16.3)	Injury and poisoning	108 (13.7)	Injury and poisoning	79 (25.2)	Respiratory system	79 (28.3)
Injury and poisoning	78 (10.2)	Infectious diseases	91 (11.6)	Infectious diseases	47 (15.0)	Infectious diseases	23 (8.2)
Ear and mastoid process	50 (6.5)	Ear and mastoid process	51 (6.5)	Nervous system	16 (5.1)	Findings, not elsewhere classified	20 (7.2)
Findings, not elsewhere classified	32 (4.2)	Findings, not elsewhere classified	36 (4.6)	Ear and mastoid process	14 (4.5)	Ear and mastoid process	12 (4.3)
> 5 year							
Respiratory system	58 (7.6)	Injury and poisoning	82 (10.4)	Injury and poisoning	46 (14.6)	Injury and poisoning	47 (16.8)
Injury and poisoning	57 (7.4)	Respiratory system	64 (8.1)	Respiratory system	14 (4.5)	Respiratory system	26 (9.3)
Infectious diseases	38 (5.0)	Findings, not elsewhere classified	33 (4.2)	Infectious diseases	11 (3.5)	Infectious diseases	14 (5.0)
Findings, not elsewhere classified	27 (3.5)	Nervous system	19 (2.4)	Nervous system	10 (3.2)	Digestive system	12 (4.3)
Nervous system	24 (3.1)	Skin and subcutaneous tissue	16 (2.0)	Digestive system	5 (1.6)	Nervous system	7 (2.5)
		Genitourinary system	16 (2.0)				

ICD-10: International Statistical Classification of Diseases and Related Health Problems, 10th revision

Supplementary table 4. Actual and proportional differences of paediatric presentations to the emergency centre during the level 5 lockdown period and similar 5-week periods before and after, compared to the previous two years.

	2020 vs 2018									2020 vs 2019								
	21 Feb – 26 Mar (Pre-lockdown)			27 Mar – 30 Apr (Level 5 lockdown)			01 May – 04 Jun (Post-lockdown)			21 Feb – 26 Mar (Pre-lockdown)			27 Mar – 30 Apr (Level 5 lockdown)			01 May – 04 Jun (Post-lockdown)		
ICD-10 category	**Actual n (%)**	**Proportional**	**p**	**Actual n (%)**	**Proportional**	**p**	**Actual n (%)**	**Proportional**	**p**	**Actual n (%)**	**Proportional**	**p**	**Actual n (%)**	**Proportional**	**p**	**Actual n (%)**	**Proportional**	**p**
I Certain infectious and parasitic diseases	-53 (-31.7)	-9.8%	0.574	-97 (-88.2)	1.1%	0.564	-155 (-221.4)	-4.4%	0.210	-80 (-32.4)	-7.1%	***<0.001***	-118 (-51.8)	2.5%	0.191	-97 (-58.1)	1.2%	0.486
VI Diseases of the nervous system	21 (50)	1.0%	***<0.001***	14 (46.7)	3.7%	***<0.001***	-8 (-50)	1.1%	0.133	-7 (-14.3)	-0.8%	0.337	-14 (-31.8)	2.0%	***0.038***	-23 (-59.0)	0.2%	0.878
VIII Diseases of the ear and mastoid process	40 (61.5)	2.3%	0.927	-23 (-104.5)	-0.1%	0.927	-52 (-371.4)	-2.6%	0.018	22 (51.2)	1.4%	0.076	-42 (-65.6)	-0.8%	0.469	-50 (-78.1)	-2.0%	0.053
X Diseases of the respiratory system	118 (27.7)	0.7%	***<0.001***	-359 (-254.6)	-18.5%	***<0.001***	-378 (-282.1)	-14.8%	***<0.001***	-16 (-3.6)	-3.3%	0.081	-411 (-74,5)	-15.3%	***<0.001***	-466 (-77.7)	-17.9%	***<0.001***
XI Diseases of the digestive system	-6 (-21.4)	-1.3%	0.370	-19 (-172.7)	-0.6%	0.370	-3 (-12.5)	2.4%	0.005	2 (7.7)	0.0%	1.000	-18 (-62.1)	-0.2%	0.862	1 (4.3)	2.8%	0.000
XII Diseases of the skin and subcutaneous tissue	-33 (-67.3)	-4.6%	0.580	-33 (-126.9)	-0.6%	0.580	-26 (-108.3)	0.6%	0.547	1 (2.1)	-0.1%	0.819	-20 (-43.5)	1.1%	0.236	-12 (-33.3)	1.9%	***0.039***
XIV Diseases of the genitourinary system	7 (17.5)	-0.3%	0.329	-6 (-42.9)	0.7%	0.329	-13 (-108.3)	0.3%	0.674	22 (122.2)	1.6%	***0.008***	-13 (-48.5)	0.5%	0.604	-10 (-45.5)	0.7%	0.334
XVIII Symptoms, signs and	39 (43.8)	1.6%	0.280	-39 (-156.0)	-1.2%	0.280	-27 (-87.1)	1.3%	0.241	38 (74.5)	2.6%	***0.004***	-45 (-64.3)	-0.8%	0.493	-42 (-57.5)	0.5%	0.652

abnormal clinical and laboratory findings, not elsewhere classified																		
XIX Injury, poisoning and certain other consequences of external causes	75 (36.1)	2.1%	***<0.001***	14 (10.5)	12.4%	***<0.001***	59 (38.6)	21.5%	***<0.001***	-1 (-0.5)	-1.0%	0.487	-12 (-8.3)	12.2%	***<0.001***	-21 (-12.1)	16.4%	***<0.001***

Supplementary table 5. Diagnostic categories of paediatric patients presenting to the emergency centre during the level 5 COVID-19 lockdown period and corresponding time periods.

	2018			2019			2020		
ICD-10 Category, n(%)	**21 Feb – 26 Mar**	**27 Mar – 30 Apr**	**01 May – 04 Jun**	**21 Feb – 26 Mar**	**27 Mar – 30 Apr**	**01 May – 04 Jun**	**21 Feb – 26 Mar (Pre-lockdown)**	**27 Mar – 30 Apr (Level 5 lockdown)**	**01 May – 04 Jun (Post-lockdown)**
I Certain infectious and parasitic diseases	220 (22.2%)	207 (17.5%)	225 (17.6%)	247 (19.5%)	228 (16.1%)	167 (12%)	167 (12.4%)	110 (18.6%)	70 (13.2%)
II Neoplasms	1 (0.1%)	2 (0.2%)	0 (0%)	0 (0%)	3 (0.2%)	2 (0.1%)	0 (0%)	0 (0%)	0 (0%)
III Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	0 (0%)	0 (0%)	1 (0.1%)	2 (0.2%)	1 (0.1%)	0 (0%)	1 (0.1%)	1 (0.2%)	3 (0.6%)
IV Endocrine, nutritional and metabolic diseases	1 (0.1%)	1 (0.1%)	7 (0.5%)	8 (0.6%)	7 (0.5%)	8 (0.6%)	2 (0.1%)	1 (0.2%)	2 (0.4%)
V Mental and behavioural disorders	1 (0.1%)	3 (0.3%)	3 (0.2%)	2 (0.2%)	0 (0%)	6 (0.4%)	0 (0%)	2 (0.3%)	0 (0%)
VI Diseases of the nervous system	21 (2.1%)	16 (1.4%)	24 (1.9%)	49 (3.9%)	44 (3.1%)	39 (2.8%)	42 (3.1%)	30 (5.1%)	16 (3%)
VII Diseases of the eye and adnexa	6 (0.6%)	4 (0.3%)	8 (0.6%)	10 (0.8%)	11 (0.8%)	14 (1%)	9 (0.7%)	2 (0.3%)	1 (0.2%)
VIII Diseases of the ear and mastoid process	25 (2.5%)	45 (3.8%)	66 (5.2%)	43 (3.4%)	64 (4.5%)	64 (4.6%)	65 (4.8%)	22 (3.7%)	14 (2.6%)
IX Diseases of the circulatory system	0 (0%)	0 (0%)	2 (0.2%)	3 (0.2%)	6 (0.4%)	2 (0.1%)	1 (0.1%)	1 (0.2%)	0 (0%)
X Diseases of the respiratory system	308 (31%)	500 (42.3%)	512 (40.1%)	442 (35%)	552 (39.1%)	600 (43.2%)	426 (31.7%)	141 (23.8%)	134 (25.3%)
XI Diseases of the digestive system	34 (3.4%)	30 (2.5%)	27 (2.1%)	26 (2.1%)	29 (2.1%)	23 (1.7%)	28 (2.1%)	11 (1.9%)	24 (4.5%)
XII Diseases of the skin and subcutaneous tissue	82 (8.3%)	59 (5%)	50 (3.9%)	48 (3.8%)	46 (3.3%)	36 (2.6%)	49 (3.7%)	26 (4.4%)	24 (4.5%)
XII Diseases of the musculoskeletal system and connective tissue	1 (0.1%)	6 (0.5%)	3 (0.2%)	8 (0.6%)	17 (1.2%)	8 (0.6%)	2 (0.1%)	2 (0.3%)	7 (1.3%)
XIV Diseases of the genitourinary system	33 (3.3%)	20 (1.7%)	25 (2%)	18 (1.4%)	27 (1.9%)	22 (1.6%)	40 (3%)	14 (2.4%)	12 (2.3%)
XV Pregnancy, childbirth and the puerperium	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (0.2%)
XVI Certain conditions originating in the perinatal period	0 (0%)	1 (0.1%)	3 (0.2%)	2 (0.2%)	2 (0.1%)	2 (0.1%)	2 (0.1%)	4 (0.7%)	3 (0.6%)
XVII Congenital malformations, deformations and chromosomal abnormalities	1 (0.1%)	0 (0%)	1 (0.1%)	1 (0.1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (0.4%)
XVIII Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	50 (5%)	64 (5.4%)	58 (4.5%)	51 (4%)	70 (5%)	73 (5.3%)	89 (6.6%)	25 (4.2%)	31 (5.8%)
XIX Injury, poisoning and certain other consequences of external causes	133 (13.4%)	119 (10.1%)	94 (7.4%)	209 (16.5%)	145 (10.3%)	174 (12.5%)	208 (15.5%)	133 (22.5%)	153 (28.9%)
XX External causes of morbidity and mortality	36 (3.6%)	41 (3.5%)	40 (3.1%)	6 (0.5%)	9 (0.6%)	8 (0.6%)	11 (0.8%)	4 (0.7%)	5 (0.9%)
XXI Factors influencing health status and contact with health services	6 (0.6%)	10 (0.8%)	14 (1.1%)	14 (1.1%)	9 (0.6%)	2 (0.1%)	15 (1.1%)	8 (1.4%)	7 (1.3%)
Unknown	33 (3.3%)	55 (4.6%)	115 (9%)	75 (5.9%)	143 (10.1%)	138 (9.9%)	185 (13.8%)	55 (9.3%)	21 (4%)

Supplementary table 6. Diagnostic categories of paediatric patients admitted during the level 5 COVID-19 lockdown period and corresponding 5-week periods immediately before and after the lockdown and for two previous years.

	2018			2019			2020		
	21 Feb – 26 Mar	27 Mar – 30 Apr	01 May – 04 Jun	21 Feb – 26 Mar	27 Mar – 30 Apr	01 May – 04 Jun	21 Feb – 26 Mar (Pre-lockdown)	27 Mar – 30 Apr (Level 5 lockdown)	01 May – 04 Jun (Post-lockdown)
ICD-10 category	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**
I Certain infectious and parasitic diseases	82 (42.5%)	78 (31.1%)	85 (29.0%)	64 (30.5%)	60 (28.7%)	37 (23.3%)	50 (30.7%)	36 (34.3%)	29 (31.9%)
VI Diseases of the nervous system	9 (4.7%)	8 (3.2%)	8 (2.7%)	28 (13.3%)	19 (9.1%)	12 (7.5%)	20 (12.3%)	7 (6.7%)	4 (4.4%)
VIII Diseases of the ear and mastoid process	3 (1.6%)	1 (0.4%)	2 (0.7%)	1 (0.5%)	3 (1.4%)	8 (5.0%)	6 (3.7%)	1 (1.0%)	0 (0.0%)
X Diseases of the respiratory system	73 (37.8%)	140 (55.8%)	131 (44.7%)	98 (46.7%)	107 (51.2%)	72 (45.4%)	56 (34.4%)	40 (38.1%)	37 (40.7%)
XI Diseases of the digestive system	2 (1.0%)	1 (0.4%)	1 (0.3%)	1 (0.5%)	0 (0.0%)	2 (1.3%)	2 (1.2%)	2 (1.9%)	0 (0.0%)
XII Diseases of the skin and subcutaneous tissue	7 (3.6%)	4 (1.6%)	1 (0.3%)	1 (0.5%)	3 (1.4%)	1 (0.6%)	4 (2.5%)	0 (0.0%)	1 (1.1%)
XIV Diseases of the genitourinary system	4 (2. %)	1 (0.4%)	0 (0.0%)	2 (1.0%)	1 (0.5%)	0 (0.0%)	7 (4.3%)	4 (3.8%)	3 (3.3%)
XVIII Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	10 (5.2%)	14 (5.6%)	15 (5.1%)	9 (4.3%)	6 (2.9%)	14 (8.8%)	13 (8.0%)	6 (5.7%)	5 (5.5%)
XIX Injury, poisoning and certain other consequences of external causes	1 (0.5%)	1 (0.4%)	5 (1.7%)	1 (0.5%)	1 (0.5%)	2 (1.3%)	3 (1.8%)	1 (1.0%)	3 (3.3%)
Other	2 (1.0%)	3 (1.2%)	45 (15.4%)	5 (2.4%)	9 (4.3%)	11 (6.9%)	2 (1.2%)	8 (7.6%)	9 (9.9%)
	193 (100%)	251 (100%)	293 (100%)	210 (100%)	209 (100%)	159 (100%)	163 (100%)	105 (100%)	91 (100%)

Supplementary table 7. Diagnostic categories of paediatric patients transferred to higher level of care during the level 5 COVID-19 lockdown period and corresponding 5-week periods immediately before and after the lockdown and for two previous years.

	2018			2019			2020		
	21 Feb – 26 Mar	27 Mar – 30 Apr	01 May – 04 Jun	21 Feb – 26 Mar	27 Mar – 30 Apr	01 May – 04 Jun	21 Feb – 26 Mar (Pre-lockdown)	27 Mar – 30 Apr (Level 5 lockdown)	01 May – 04 Jun (Post-lockdown)
ICD-10 category	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**
I Certain infectious and parasitic diseases	9 (15.5%)	15 (17.4%)	7 (11.3%)	15 (14.9%)	11 (12.2%)	11 (12.6%)	20 (21.7%)	21 (32.8%)	7 (10.8%)
VI Diseases of the nervous system	5 (8.6%)	5 (5.8%)	5 (8.1%)	8 (7.9%)	7 (7.8%)	12 (13.8%)	7 (7.6%)	6 (9.4%)	3 (4.6%)
X Diseases of the respiratory system	8 (13.8%)	23 (26.7%)	15 (24.2%)	22 (21.8%)	30 (33.3%)	20 (23.0%)	10 (10.9%)	6 (9.4%)	12 (18.5%)
XI Diseases of the digestive system	8 (13.8%)	6 (7.0%)	2 (3.2%)	5 (5.0%)	7 (7.8%)	5 (5.7%)	11 (12.0%)	3 (4.7%)	11 (16.9%)
XII Diseases of the skin and subcutaneous tissue	10 (17.2%)	6 (7.0%)	9 (14.5%)	9 (8.9%)	7 (7.8%)	4 (4.6%)	10 (10.9%)	6 (9.4%)	3 (4.6%)
XIV Diseases of the genitourinary system	0 (0.0%)	2 (2.3%)	0 (0.0%)	2 (2.0%)	1 (1.1%)	3 (3.4%)	4 (4.3%)	2 (3.1%)	1 (1.5%)
XVIII Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	1 (1.7%)	4 (4.7%)	2 (3.2%)	3 (3.0%)	7 (7.8%)	1 (1.1%)	3 (3.3%)	0 (0.0%)	2 (3.1%)
XIX Injury, poisoning and certain other consequences of external causes	15 (25.9%)	16 (18.6%)	13 (21.0%)	30 (29.7%)	12 (13.3%)	25 (28.7%)	23 (25.0%)	16 (25.0%)	23 (35.4%)
Other	2 (3.4%)	9 (10.5%)	9 (14.5%)	7 (6.9%)	8 (8.9%)	6 (6.9%)	4 (4.3%)	4 (6.3%)	3 (4.6%)
	58 (100%)	86 (100%)	62 (100%)	101 (100%)	90 (100%)	87 (100%)	92 (100%)	64 (100%)	65 (100%)