

Experience of COVID positive pediatric surgical patients from a tertiary care center in a Himalayan state.

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Abstract

Introduction: COVID-19 pandemic had a significant impact on the pediatric and neonatal surgery. The COVID-19 infection in children present either with mild symptoms or with atypical clinical features mimicking other infectious diseases. This study was conducted to assess the impact of COVID-19 pandemic and lockdown on the pediatric surgical cases admitted and managed at our Institute.

Materials and Methods: Clinical characteristics and management & its outcome were noted down. Clinical characteristics included age, weight, gender, residence, nature of disease, any past history of surgery, history of contact with COVID patient, any recent COVID infection. These variables were compared with the patients managed during pre-COVID-19 era of same duration. All the babies admitted for routine and some emergency cases were tested for COVID-19 using RT-PCR method. COVID tests were done post-operatively in emergency cases.

Results: During the study 630 patients were admitted and managed in our department, which included 200 elective, 150 semi emergencies, and 280 emergency cases. The average age was 19.53 ± 23 months. The study included 190 surgical neonates also. There were 400 male and 230 female patients. A total of 20 patients were tested positive during the study period. Among these 20 patients, 12 were tested positive on preoperative screening, while as eight cases were positive on post-operative COVID testing. Operation theatre days were reduced from 6 days to 4 days per week. The several measures undertaken in the outpatient clinic, operation theatre, pre and post-operative period to minimize the spread of COVID-19 virus from child to caregiver and surgical staff were highly effective. During these 9 months five doctors in our department got infected, with mild to moderate symptoms of COVID 19. They resumed their duties after an average of 2 to 3 weeks. Our academic activities got significantly hampered, although bedside teaching and case discussions continued in wards and operation theatres.

Conclusion: COVID -19 pandemic effects pediatric population also, surgeries and the concern for its transmission. We continue to perform routine neonatal and pediatric surgical cases, while adapting the standard safety protocols. We believe that health professionals who use the appropriate personal protective equipment may continue to work in outpatient and operating rooms.

Keywords: COVID-19, Coronavirus, RT-PCR, Pediatric surgery, Post Graduate (PG), Senior Resident (SR), Elective surgery, Semi-emergency, Emergency, Lockdown, Outdoor Patient Department (OPD).

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Introduction

COVID-19 has been everywhere for one year. The first case was reported in early December 2019 and was tagged Pneumonia of unknown origin from the sea whale market in Wuhan City, Hubei Province, China [1].

Cases started slowly to swell up. The WHO was informed by the Chinese health authorities about the novelty of this coronavirus genome. World Health Organization (WHO) was informed by the Chinese health authority about the novel nature of this genome of corona virus [2].

Since December 2019, the disease has been declared a public health emergency of global concern by the WHO from January 30 to 2020. Globally USA, Italy, Spain, China, Germany, and Iran have been the most hit countries [3].

In India, there has been an alarming increase in the incidence of COVID-19. As of December 31, the total number of COVID-19 cases has increased to over one and a half million.

Fortunately, children and teenagers have not been the most affected by the virus, even though these two groups are not immune to this new virus. Although vulnerable groups among population <20 years are; prematurity, cystic fibrosis, post-transplant patient's malignancy, children on steroid therapy.

In many countries, there was a complete shutdown of hospital-based services for elective surgery. Clearly, the unprecedented pressure on health services was all over the world pediatric surgery Services were no exemptions [4,5].

Pediatric surgical care can only be indirectly impacted by this pandemic, but there are special considerations that warrant special attention.

This manuscript provides a retrospective analysis of the impact of COVID-19 on pediatric surgical services, data on operated COVID-19 cases, and the delay caused by COVID-19 infection in post-operative surgical conditions.

In addition, we will be analyzing the impact of COVID-19 infection on our staff members, including rotator PGs, senior residents, and faculty members. We will also be analyzing the impact of the COVID-19 pandemic on the school calendar for our pediatric surgical students at our institute.

Methods

We have retrospectively recovered data from all routine semi-emergency and emergency patients managed in our department during the pandemic from March 1 to December 31, 2020. Patient characteristics included age, gender, basic investigations, specific investigations, and diagnoses were entered in the excel software system.

Positive COVID-19 cases were recorded in a separate excel sheet, focusing on the gender, age, travel history and history of contact with a positive case. Clinical characteristics of all patients, average age, diagnoses, symptoms/asymptomatic, positive test date negative test date, operation date, number of hospital stay in days, and the outcome of management/surgery.

The duration of surgery delay in days and extended post-op stay in hospital due to COVID-19 was noted. How the COVID-19 virus affects the outcomes of different surgical procedures performed in such cases.

We analyzed the measures taken by our hospital and department for providing pediatric surgical services in the COVID-19 pandemic. During this period we followed a standard departmental protocol for the function of the outdoor clinic, which included a barrier of about 2 to 3 feet between the surgeon and the baby.

We did not close the OPD clinic, in fact we received almost the same number of pediatric patients as we were attending in pre COVID era (259/week COVID era vs. 300 cases/week in the pre-COVID era only one parent was allowed to accompany the child inside the clinic.

The mask was kept mandatory for patient and caregiver/parent. For each patient, a new pair of gloves was used by the examining clinician. COVID-19 positive patients were admitted in the separate COVID block, while as COVID negative patient planned for surgery were admitted in routine pediatric surgery ward.

All the healthcare professionals in our department followed the standard precautions to minimize the risk of COVID-19 transmission. Routine patient planned for surgery if found to be positive on OPD basis was quarantined for 2-3 weeks and then admitted after negative COVID status.

Any nursing staff, surgeon, or theatre assistant on accidental exposure to it COVID-19 patient was quarantined for a period of 2 weeks.

The COVID-19 testing was performed for patients undergoing elective surgery. The impact of rotation of PG to the COVID unit and the impact of COVID lockdown on the outdoor patients rush was analyzed.

We compared the number of patients participating in OPD during the non-COVID pandemic. We analyzed the psychological issues related to the quarantine of a mother of a baby who turned COVID-positive during pre-operative screening.

The data was analyzed and results were withdrawn. The hospital ethical committee approved this study. Patients were categorized according to a classification protocol formulated by our department (elective, semi emergency and emergency) (Table 1).

Elective	Semi Emergency	Emergency
Urethroplasty (8)	CDH (8)	Trauma(35)
ASARP (15)	Biliary atresia (6)	Acute appendicitis (Open-23, Lap -18) (NOTA-20)
PSARP (12)	IHPS (10)	Intussusception-hydrostatic reduction (20) Operative management (12)
Pullthrough for HSD (12)	Inguinal hernia (29)	Gut perforation (15)
Cholecystectomy (17)	Oncological surgeries (18)	Colostomy/ileostomies (ARM,HSD associated with HAEC) (24)
Splenectomy (7)	Pyeloplasties (24)	Atresias (intestinal atresia esophageal atresia, duodenal obstruction) (31)
Orchidopexies (30)	Abdominal catheter insertion for dialysis (4)	Malrotation (8)
Hydatid disease (10)	GI Bleed requiring surgical (8)	Ascaris induced worm obstruction (13)
Ureteric re-implantation (14)	Complicated UTI(14)	Obstructed hernias (6)

Choledochal cysts (10)	Posterior Urethral Valves (11)	Acute scrotum (4)
Circumcision (11)	UVR/Megaureters with sepsis (17)	Thyroglossal cyst abscess drainage (12)
Stoma Closure (10)	Neurogenic bladder Appendico vesicostomy (1)	Ureterostomies(15)
Meatal stenosis (12)		PCN insertion (8)
Hydrocele (21)		Tube-drainage(NEC) –(8)
Closure of omphalocele(7)		
Umbilical hernia (7)		
Gastric pull up (2)		
Gastrostomies (3)		
Bladder augmentation (2)		

Table 1. Showing classification of disease and number of procedures of our department.

COVID-19 assessment was completed using poly-chain RT-PCR by the Microbiology Virology Unit. All RT-PCR patients positive after surgery were sent to COVID-19 wards and managed by resident and post-graduate surgeons.

Results

Overall, 630 patients were admitted during the study period. It included 200 elective, 150 semi-emergencies and 280

emergency cases. Students t-tests were used to compare the variables. We compared the total number of routine elective cases/surgeries with the pre-COVID era there was a decrease in the number of elective cases and surgeries, 200 vs. 370 (P-value=0.043). There was no significant decline in admission rates for semi-urgent cases 150 from 190 (P-value=0.0411). The number of emergency cases reduced from expected 400 to 280 (400 vs. 280, P-value=0.068) (Table 2).

Time	Elective procedures	Semi emergency procedure	Emergency procedure
Pre- COVID-19 era	370	190	400
COVID-19 era	200	150	280
P value	0.043	0.0411	0.068

Table 2. Showing the frequency of patients in pre-COVID and COVID-era.

The average age was 19.5, 323 months. Neonates constituted about 190 out of 630%. Table 1 shows indications (categorization) for the management of patients admitted during the study period.

All the types of surgeries decreased in number compared to the last 9 months of the pre-COVID-19 period.

The number of laparoscopic also reduced significantly from 98 to 65 (P-value=0.013).

The pathology operated during the pre-COVID and COVID era was almost similar. The frequency of all the emergency surgical procedures was similar in the Pre-COVID era (P-value=0.011).

The most common indication in emergency cases was gastrointestinal atresia's (esophageal atresia, duodenal atresia, and small gut atresia), Anorectal Malformation (ARM), meconium ileus, necrotizing enterocolitis, and Hirschsprung

Disease, (HSD). Overall the incidence of trauma admissions to our hospital reduces during this period to 50% as compared to pre-COVID period.

There were 400 male and 230 female patients. There was a significant decrease in the number of elective cases, 200 versus 370 (P=0.043).

The number of emergency cases reduced from 400-280 (P=0.068). Semi-emergency caseload decreased from 190 (during pre-COVID 19 months) to 150 during COVID-19 era (P-value=0.41).

A total of 20 patients were tested positive during the study period. We performed semi emergency and elective cases, including choledochal cysts, Pelvi-Ureteric Junction Obstruction (PUJO), symptomatic cholelithiasis, vesicostomies, stoma closures, and some cystic lesions like hydatid cyst, mesenteric and duplication cysts. We performed about 18 laparoscopic and 23 open appendicectomies during this era (Table 3).

	March-May	June-August	September-December	Total
Elective	72	42	86	200
Semi-emergency	60	37	53	150
Emergency	100	80	100	280

Table 3. Showing the month wise cases managed in COVID pandemic.

Wound infection developed in 6 patients (3 in appendicectomy patients and 3 in gastrointestinal atresias).

Out of 190 neonates operated during the COVID, 9 babies died due to associated cardiac lesions sepsis and ventilator-associated issues.

Three babies had either sepsis, ventilator associated pneumonia or refractory shock. Two babies had meningitis associated with ASD or VSD.

Data of COVID-positive patients

The numbers of patients who went to emergency surgery and post-operative positive were 12. The average age in positive children was 6.15 ± 7.162 (24 days-11 years). There were 12 male and 8 female patients. Thirteen patients were asymptomatic, while the remaining seven patients had mild respiratory tract infection, fever or nonspecific symptoms. Respiratory symptoms included running nose, fever, cough, wheez etc (Table 4).

S.No.	Age	sex	Diagnosis	COVID symptoms (asymptomatic / mild symptomatic)	Operation done	Pre-OP status	Post-OP status	Delay in procedure	Outcome of procedure
1	7	M	Appendicitis	Asymptomatic	Open appendicectomy	-	+	1	Alive
2	6	F	Worm Obstruction	Asymptomatic	Resection anastomosis	-	+	Nil	Alive
3	10	M	Appendicitis	Asymptomatic	Open appendicectomy	-	+	-	Wound infection
4	12	F	Volvulus	Mild respiratory symptoms	Ladd's procedure	-	+	1	Alive
5	3	M	Torsion Testis	Asymptomatic	Detortion	-	+	None	Alive
6	10	M	Meikles bleed	Asymptomatic	Meckels Diverticulectomy	+		3	Alive
7	24 Days	M	NEC	Mild respiratory symptoms	Tube drainage		+	2	Died
8	6	F	Adherence obst.	Asymptomatic	Ahesiolysis	+		2	Alive
9	9	F	Renal Laceration	Mild respiratory symptoms with fever	DJ-Stent	-	+	9	Alive
10	10	M	Liver Laceration	Mild respiratory symptoms with fever	Managed conser vatively	-	+	-	Alive
11	8	M	Bladder Neck Injury	Asymptomatic	Repaired		+	2	Alive
12	11	M	Appendicitis	Asymptomatic	Operated	+		3	Alive
13	9	M	Complicated Appendicular lamp	Mild respiratory symptoms with fever	Managed Conservatively vatively		+		Adhesive SBO
14	6 months	F	PUJO	Asymptomatic	Pyeloplasty	+		40	Alive
15	2	M	Obstructed Enterocele	Asymptomatic			+	None	Alive

16	6	F	Cholelithiasis	Asymptomatic	Lap cholecystectomy	+		38 days	Alive
17	10	M	Nerogenic bladder	Asymptomatic	Appendico Vesicostomy	+		52 days	Alive
18	1	F	PUJO	Asymptomatic	Pyeloplasty	+		31 days	Alive ±
19	1	M	inguinal hernia	Mild respiratory symptoms	Herniotomy	+		29 days	Alive
20	2	F	Obstructed inguinal hernia	Asymptomatic	Reduction with herniotomy		+	None	Alive

Table 4. Showing characteristics of COVID-19 patients undergoing surgery.

The average number of days that delayed surgery in routine cases whose RT-PCR came positive was 23.05 ± 11.36 days. In emergency cases there was no delay in surgery. Overall average delay in procedures in 20 COVID positive surgical babies was 10.10 ± 22.45 days.

In elective and semi-emergency cases the average delay was days 24.75 ± 28.33 days there was one neonatal death among people diagnosed with NEC who contracted COVID-19.

The number of infected doctors in our unit was 2 SR of 3 PG and 2 employees during those 9 months.

The number of routine OT days was reduced from six days a week to four days a week. The pediatric surgery ward was clubbed for 6 months with adult surgery urology.

During the pandemic, the academic activities of the pediatric surgery were affected. We routinely held seminars and three discussions a week. These two academic events were interrupted. While routine surgical teaching was not affected much, there was always a gap in education. As reported by many hospitals virtual learning video lectures can help cope-up some gap in academics. Our state observed a sudden rise of cases in the month of May, June and July.

Discussion

Children are disproportionately the victims and most vulnerable group of society during this COVID-19 pandemic. Our department is the only tertiary care hospital/department in catering the 8-11 million populations in the valley. Our observation of this comparison demonstrated that although routine cases slightly decreased in number but it did not have any statistical significance as observed by many authors worldwide [6,7]. There were some changes in pediatric surgery services, which included primarily the reduction of routine over time. Evidently due to the unavailability of physicians and anesthesia technicians who rotated to assist with COVID-related tasks. Furthermore, during lockdown interstate migration was also restricted. This has led to a continuous influx of routine/semi-emergency and emergency cases in our tertiary care department. The decrease in the number of routine cases could have been due to a decrease in the number of hospital visits because of fear of acquiring an infection at the

hospital. The other reason might be the effect of tight containment imposed by the government.

Although our ward has been clubbed with adult urology ward and possibly due to less stay for patients required for most pediatric surgery procedures. A number of factors have affected pediatric surgical practices worldwide because of insufficient hospital capacity, pediatric ICU beds, relative deficiency of man power, shortage of medicines and equipment (PPE, masks). In addition, a rigorous policy has been implemented to reduce the risk of nosocomial transmission of COVID-19 to patients and caregivers. Some countries reported a shortage of medical resources during the pandemic but we didn't encounter such problems [8]. Routine RT-PCR pre-operatively was done 2 days before the date of surgery. The babies who had COVID-19 had to be quarantined along with the mothers. Our unit did not observe any decrease in infant/neonatal cases. The reason for this may be that all newborns were referred to our tertiary care hospital. As all other medical colleges and district hospitals had discontinued routine and emergencies.

We continued to perform neonatal and infantile elective cases. The decrease in patient load could be probably related to the fact that caregivers were worried about the safety of bringing their children to the hospital, as was observed by other authors [9]. Most of the COVID-19 positive Pediatric surgery patients actually presented to the hospital with a variety of surgical pathology. The cases were found to be positive on pre-operative screening in elective cases or post-operative testing in patients undergoing emergency surgery.

Hospital visitors were a challenge, especially in this COVID-19 pandemic, as the involvement of family members and guardian supports the child during hospitalization [10]. Children and caregivers are an important link in the chain of transmission, facilitating and amplifying the transmission of the virus. Caregivers should be limited in the hospital only one caregiver should be allowed. This could be one factor that could prevent additional transmission of the virus. In our hospital, throughout the day 4 or 5 visits were allowed to visit the patient.

Laparoscopic surgery remained contentious during the pandemic as it could risk transmission by aerosol, as recommended by the reports [11,12]. We carried on with laparoscopic surgery, but with less frequency (decreased by

50%). Our laparoscopic technique does not differ from previous surgeries. While many methods have been proposed to reduce the risk of COVID-19 cross-infection during laparoscopic surgery. These methods include pressure reduction, gas leak reduction, and progressive aerosol extraction [13].

Although data from the global literature show declining trends in elective cases, the number of emergency interventions does not appear to have been significantly affected by the COVID-19 pandemic [13]. This observation was confirmed by our review. Over these 9 months, we operated approximately 360 emergency cases compared to around 400 expected. Despite the decrease in the number of operation theatre days from 6 to 4. During those nine months, many pediatric surgery centers have adopted different evidence-based guidelines, while others use logic and hope. There is no evidence that decreasing the routine work like outpatient department, admissions and elective surgeries after COVID screening could actually decrease the transmission in the hospital or to the health providers [14]. We believe the standard use of face masks and disposal gowns with universal precautions can limit the transmission of corona virus in wards, OPD and OT's.

Furthermore, we believe that during the pandemic, every emergency must be taken as positive and managed with caution. These include face masks, face shields and PPE used by all the other members and surgeons to reduce the risk of transmission. In our hospital, all operated emergencies were tested for COVID-19 after surgery. A positive case was referred to the COVID-19 unit and a negative case was managed in our own unit.

We also observed a slow decline in fear of the COVID-19 virus among health care providers in the general population and patients. This gradual decline in fear of infection may have been due to better education, low mortality and the infection of at least one person in each household. The community transmission trends also reported the chances of infection being more in community than in the hospital [15]. The above factors resulted in the back tract of routine surgical work in the month of January 2021. The hope of a vaccine becoming available has also affected the health care workers performing the duties of this noble profession. Delaying stoma closure could cause significant morbidity to the babies. Even though many centers stop or delay the closing of the stoma [16].

Trauma admission patient decreased during the pandemic. We observed a 50% decline in admission of trauma patients during the study. Trauma patients constituted a subgroup that needs treatment despite their COVID status [17]. The reason for this decline was restrictions imposed by the government to unnecessary movement and transportation. In our study admission of trauma patients reduced to half. This was contrary to observation made by some authors, who received very few number of trauma patients [18]. This variation could be because of difference in the effectiveness of restrictions and lockdown imposed by the local authorities. Most of the population belongs to rural areas, where the imposition of lockdown and restrictions are practically difficult.

Delaying an elective or semi emergency procedure for a surgical pathology could have a significant psychological strain on caregivers or older children. Although we only rescheduled 25% of the expected routine cases, but in some countries there was total closure of routine work [16]. We hope this number did not have much physiological impact on our patients and care givers. Furthermore, if rescheduling of a pediatrics surgical procedure is needed during a peak period of pandemic, it is important for the health care workers to adverse the queries and issues of parents for effective management of the pediatrics surgical patients.

Conclusion

COVID-19 has affected the functioning of all the hospitals worldwide. It is really a challenge to manage both COVID-19 positive patients and elective surgical work. Resources need modifications in such a way that does not delay semi emergency pediatric surgical procedures and to maximize the safety of surgical staff. We recommend individualizing reorganization of manpower and hospital infrastructure to suit local needs. Classification for categorization/triage of cases in elective, semi emergency, and emergency should also be made depending on the region, hospital infrastructure, manpower, and caseload. All these measures can mitigate disaster of pandemic by decreasing the transmission of Covi-19 infection and its outcome, while delivering and optimal pediatrics/neonatal surgical disease management.

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