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Preparedness for an Isolation Unit during Covid-19 Pandemic in PICU of Minia University Hospital: Practical Considerations and Outcomes

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Abstract

Background: Admission to the pediatric intensive care unit (PICU) is compulsory for children with a severely complicated form of COVID-19, who are hemodynamically unstable. Our study determined the degree to which our PICU preparedness measures impacted patient outcomes and infection control management within the PICU of Minia University Hospital in Egypt.

Methods: 179 pediatric patients, admitted to the PICU isolation unit with suspected or confirmed diagnosis of COVID-19, were studied retrospectively. We conducted descriptive analyses on the patients' characteristics and outcomes and the basic concepts and procedures for PICU readiness are discussed.

Results: The patients ranged in age from one month to sixteen years, with an average age of 8.60±4.84 years, 44.69 % of whom were males. Fever, shortness of breath, and cough were the most common symptoms on admission. The most common comorbidities were neurological disorders, heart disease, and respiratory disease, with percentages of 27 %, 25 %, and 23 %, respectively. Overall, mortality was 22.9 %. Only 21 (0.5%) of the hospital's healthcare staff were infected. The infection did not spread to other non-COVID parts of the hospital.

Conclusion: Our PICU strategies and preparation ensured adequate prevention of infection spreading to other units and HWCs, as well as lowering mortality and improving COVID-19 patients' outcomes.

Key Words: COVID-19, PICU, preparedness, Strategies.

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1- INTRUDACTION

By the end of 2019, a new coronavirus had been identified. It was found to be rapidly spreading, resulting in an outbreak in China, which was quickly followed by other countries worldwide. Coronaviruses are important pathogens in both humans and animals. The World Health Organization (WHO) reported COVID-19, which stands for coronavirus 2019 disease, in February 2020 (1). The virus that causes COVID-19 has been identified as a severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) by "the Coronavirus Study Group of the International Committee" (2), and the WHO declared COVID-19 a pandemic in March 2020 (3).

Although there are exceptions, research suggests that children are less susceptible to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infections than adults (4-6). When infected, children often stay asymptomatic or acquire minor diseases (7). According to a joint report from the American Academy of Pediatrics and the Children's Hospital Association, a total of 2,816,775 COVID-19 pediatric cases were reported in the United States of America on January 28, 2021; this figure represents only 12.8 percent of cases in the country and 1.2–2.9 percent of hospitalizations associated with the disease (8). Child mortality represented 0.00–0.21 percent of COVID-19 fatalities in the reporting. A few pediatric cases necessitated admission to the pediatric intensive care unit (PICU), mechanical ventilation, and extra life-saving treatments. Even though it occurs infrequently, mortality is possible (8).

A multinational, multicenter cohort study conducted in Europe found that 62% of 582 children with laboratory-confirmed SARS-CoV-2 infection and a median age of 5.0 years were hospitalized, 8% required admission to the pediatric intensive care unit, 5% had radiological findings suggestive of acute respiratory distress syndrome, and 4% required intubation and mechanical ventilation (9). Only 4 out of 582 cases (0·69%) died (9). In a recent multicenter Italian study aimed at examining the epidemiological, clinical, and therapeutic aspects of SARS-CoV-2 infection in infants, children, and adolescents, 19.6 % of children developed one or more complications and 38.8 % of them were hospitalized for COVID-related causes (10). The mean age of children with complications was substantially higher than that of children with simple infections. Fever or abdominal pain at the beginning and co-morbidities were found to be risk factors for complications in multivariate analysis (10). The differences in hospitalization and PICU admission rates between trials appear primarily due to protocol or clinical practice rather than disease severity (11). Children with moderate to extreme signs and symptoms, as well as those that are at risk of complications, should be hospitalized. The seriousness of the condition dictates the site of admission, ward versus pediatric intensive care unit (PICU), and duration of treatment. The availability of an intensive level of care has played a pivotal role, especially in those who develop severe pulmonary complications, are hemodynamically unstable children, and have significant respiratory compromise, or potentially life-threatening problems (12). The coronavirus disease 2019 (COVID-19) has changed how healthcare facilities interact within the communities and have affected healthcare facilities operations. For updating guidance, it is required to understand the ongoing response needs of healthcare systems and facilities. The guidance should outline goals and methods for healthcare facilities to operate effectively and safely during the COVID-19 pandemic. Also, the guidance should offer advice for healthcare facilities to interact strictly during the COVID-19 pandemic, adjust the way they operate healthcare services to scale back the need

to provide in-person care, follow infection prevention and control protocols tailored to their setting and provide necessary in-person clinical services for conditions besides COVID-19 within the best safety ways minimizing disease transmission to patients and healthcare workers (HCW). PICUs are getting to be simultaneously challenged on multiple fronts. These include resource limitations, space limitations, infection control, protection of healthcare workers (HCWs), and adaptation of services to a rapidly evolving pandemic situation (13, 14).

1-1. Objectives

The current study elucidates the critical care response to the COVID-19 pandemic within the tertiary pediatric intensive care unit at Minia University Hospital in Egypt, intending to determine the degree to which our PICU preparedness measures impacted patient outcomes and infection control management within the PICU and across the hospital.

2- MATERIALS AND METHODS

This study was conducted to assess the critical care response to the COVID-19 pandemic at the tertiary pediatric intensive care unit (PICU), Minia University Hospital, in El-Minya governorate, Egypt, during the period between March 2020 and March 2021.

The strategies developed for being used in the PICU dealt with the location, the healthcare workers (HCWs), the resources, infection control procedures, and guidance for maintaining routine PICU capability and services. After receiving ethical approval from the Faculty of Medicine, Minia University's ethical committee, data were collected retrospectively from patient records.

2-1. PATIENTS

One hundred seventy-nine patients were admitted to the PICU isolation unit during the study period with a suspected or verified diagnosis of COVID-19 using the CDC case description (13).

Rapid identification and isolation of suspected COVID-19 patients and rapid diagnostic testing were made available. All pediatric patients were screened in the emergency room, inpatient wards, and PICU. Screening for the possibility of COVID-19 was based on 1) contact history with a confirmed or suspected case, 2) symptoms such as new-onset fever, respiratory tract symptoms such as cough and dyspnea, or other consistent symptoms such as diarrhea; and 3) risk factors such as whether the patient resides in or has traveled to a location with community transmission during the previous two weeks (15, 16). Risk stratification protocols for COVID-19 were disseminated to HCWs.

Due to limited ability and resources, testing the suspected COVID-19 patients was limited to those with moderate to serious illness or those requiring PICU admission; and COVID-19 was often diagnosed presumptively based on a compatible clinical presentation in an exposure-risk environment, especially when no other cause for the symptoms was apparent.

In the initial research and specimen collection, to classify SARS-CoV-2 RNA from the upper respiratory tract, we used a reverse transcription-polymerase chain reaction (RT-PCR) assay. We used nasopharyngeal swab specimens from healthcare professionals and strictly adhered to infection control standards during specimen processing (17, 18). In our center, we demanded a full blood count (CBC) with differential and radiological imaging such as chest X-ray and CT scan. We tracked cytokine release syndrome using blood pressure, oxygen saturation, and biomarkers to look for hypotension and worsening hypoxemia. C-reactive protein (CRP), D-dimer, ferritin, and lactate dehydrogenase (LDH) are

measured at baseline in all cases, and interleukin-6 (IL-6) is measured in some cases, especially those with progressive disease. If there was a concern for worsening conditions, we checked CRP, D-dimer, ferritin, and LDH twice a week or more. Additional inquiries were conducted on an as-needed basis. All cases were diagnosed and treated based on the guidelines developed by the Egyptian Ministry of Health (19). The length of stay in the PICU, the need for and the duration of mechanical ventilator assistance, and the hospital stay outcome were used to determine the patient's prognosis.

2-2. Methods

During the COVID-19 pandemic, our plans outlined priorities and procedures for healthcare facilities to function efficiently and safely and adhere to infection prevention and control procedures, preventing disease spread to other patients or HCWs in the PICU unit or other hospital units.

We adopted the policies of Minia University Hospital's Higher Committee for Corona Crisis Management (HCCM), which has been in place since the pandemic began in the early 2020s. These policies meet the requirements regarding the increase in Coronavirus infection rates over the next step, including the preparation of hospitals and medical teams. The HCCM emphasized increasing the extent of maximum preparedness in university hospitals, daily follow-up and review of central care beds and their readiness, numbers of ventilators owned by university hospitals to be used when required, taking all preventive and control measures to combat the crisis, submitting a daily report on the epidemiological situation, and emphasizing medico legal security. As part of the committee's recommendations to deal with suspected or confirmed cases, a separate isolation unit was prepared within the PICU and intensive training courses were conducted by the infection control unit, specifically for medical and nursing staff in the PICU. An isolation PICU ward was constructed that was geographically isolated from other wards and met all the Ministry of Health's requirements, allowing for separating equipment and personnel and leading to a more efficient containment.

Our patient placement strategies were as follows: patients with suspected or confirmed SARS-CoV-2 infection were admitted to their designated wards upon admission to PICU, and as a measure to limit HCW exposure, our center considered designating entire units, and HCW was assigned to take care of the patients with suspected or confirmed SARS-CoV-2 infection using all personal protective equipment (PPE).

We strictly restricted the patient's possibility to leave the room unless it was for medical reasons. We conducted procedures/tests in the patient's room wherever possible. To reduce the need for patient transport, our PICU followed all guidelines recommended by WHO and CDC (15, 16, 19).

2-3. Ethical considerations

This study was approved by the ethical committee, faculty of medicine, Minia University, Egypt. A written consent was obtained from each parent for participation in the study and publication of the results. The participant's anonymity and confidentiality was protected and they had the right to withdraw from the research. Deceptive practices were avoided.

2-4. Data analysis

The data were statistically analyzed using SPSS version 22 for Windows (Chicago, IL. USA). Categorical variables were described as frequency and percentages, while continuous variables were expressed as mean (standard deviation).

3- RESULTS

During the study period, 179 pediatric cases were admitted to our tertiary PICU isolation unit with a suspected or confirmed diagnosis of COVID-19, ranging in age from 1 month to 16 years with a mean age of 8.60±4.84 years, 80 (44.69%) of whom being males. Seventeen patients (9%) had positive PCR for COVID-19 when tested by nasopharyngeal swab, while 137 (76.5%) were admitted as Suspected cases, with negative PCR results and for 25 (13.97%) cases, *COVID-PCR was not done.* The overall mortality rate was 41 children (22.9%) out of all cases. Only four mortality cases were confirmed with COVID-19, making the mortality rate for confirmed COVID-19 to be 2.23% (**Table 1**).

Table-1: Demographic data, clinical course and outcome of cases admitted to PICU isolation unit during the study period

Characteristics		Total cases (n=179)
Age (years) (mean ±SD)		8.60 ±4.84
Sex	Male n (%)	80 (44.69%)
	Female n (%)	99 (55.31%)
The total number of cases	Confirmed cases: n (%)	17 (9%)
	Suspected cases with negative COVID-PCR: n (%)	137 (76.5%)
	Suspected cases COVID-PCR not done n (%)	25 (13.97%)
Clinical course during PICU stay	Inotropic support: n (%)	111 (62.01%)
	Mechanical ventilation support: n (%)	80 (44.7%)
	Duration on MV (hr.): (mean±SD)	7±4.07
	Length of PICU stay: (Days): (mean±SD)	9 ±5.4
Outcome at the end of hospital stay	Survivor's n (%)	138 (77.09%)
	Confirmed cases n (%)	13/138 (7.3%)
	Suspected cases with negative COVID-PCR: n (%)	114/138 (63.7%)
	Suspected cases COVID-PCR not done n (%)	11/138 (6.15%)
	Non-survivors n (%)	41 (22.9%)
	Confirmed cases n (%)	4/41(2.23%)
	Suspected cases with negative COVID-PCR: n (%)	23/41(12.8%)
	Suspected cases COVID-PCR not done n (%)	14/41(7.8%)

MV: mechanical ventilator; COVID-PCR: polymerase chain reaction for coronavirus

Among Suspected cases with negative COVID-PCR or not done, fever in 81 cases (45.25%), and respiratory symptoms, including hypoxia, shortness of breath, or cough in 79 cases (44.13%), were the most common symptoms on admission. and 14(7.82%) from those with confirmed Covid presented with respiratory symptoms and fever represented by 13(7.26) for confirmed cases (**Table 2**).

Eighty (44.7%) patients from suspected cases and 15(8.38%) from confirmed cases had had Lymphocytopenia, and extreme neutropenia had been recorded in two patients. The most common imaging findings were ground-glass opacities and consolidation or pneumonic infiltrates (**Table 3**).

Demographic data and characteristics of PICU admittance, presence of severe chronic comorbidities and Notable admission indications among non-survivors' cases are demonstrated in (**Table 4**).

Table-2: Clinical data of among studied cases admitted to PICU isolation unit during the study period

Variable		Suspected cases with negative COVID-PCR or not done: n (%)=162\179 (90.50%)	Confirmed cases n (%)=17 \179 (9%)
Presenting Symptoms	Fever	81 (45.25%)	13(7.26)
	Respiratory symptoms	79 (44.13%)	14(7.82)
	Rash	44 (24.58%)	1(0.56%)
	Gastrointestinal symptoms (abdominal pain, vomiting, diarrhoea)	78 (43.58%)	2 (1.12%)
	Mucous membrane involvement	26 (14.53%)	1(0.56%)
	Neurological symptoms (headache, lethargy, confusion, convulsion)	56 (31.28%)	2 (1.12%)
	Conjunctivitis	20 (11.17%)	1(0.56%)
	Lymphadenopathy	9 (5.03%)	0 (0%)
	Swollen hands/feet	4 (2.23%)	2 (1.12%)
Clinical findings	Shock	71 (39.66%)	5 (2.79%)
	Acute respiratory failure requiring non-invasive or invasive ventilation	59 (32.96%)	5 (2.79%)
	Myocardial dysfunction (by echocardiogram or elevated troponin/BNP)	49 (27.37%)	2 (1.12%)
	Arrhythmia	12 (6.7%)	0 (0%)
	Encephalopathy, seizures, coma, or meningoencephalitis	49 (27.37%)	3(1.68%)
	Acute kidney injury	5 (2.79%)	3(1.68%)
	Serositis (small pleural, pericardial, and ascitic effusions)	20 (11.17%)	4(2.23%)
	Hepatitis or hepatomegaly	12 (6.7%)	3(1.68%)
History of chronic disease (before PICU admission)	None	71 (39.66%)	12 (6.7%)
	Rheumatic heart disease	1 (0.56%)	0 (0%)
	Congenital heart disease	21 (11.73%)	4(2.23%)
	Diabetes mellitus	4(2.23%)	3(1.68%)
	Respiratory disorders	21 (11.73%)	2 (1.12%)
	Metabolic disorder	8 (4.47%)	2 (1.12%)
	Neurological disorders	21 (11.73%)	6(3.35%)
	Renal disorders	2 (1.12%)	1(0.56%)

Table-3: Laboratory and imaging data of among studied cases admitted to PICU isolation unit during the study period

Variable	Suspected cases with negative COVID-PCR or not done: n(%)=162\179 (90.50%)	Confirmed cases n(%)=17 \179(9%)
Laboratory findings		
Abnormal blood cell counts		
Lymphocytopenia	80 (44.7%)	15(8.38%
Neutrophilia	59 (32.96%)	9(5.03%)
Anaemia	64 (35.75%)	6(3.35%)
Thrombocytopenia	75 (41.9%)	5 (2.79%)
Elevated inflammatory markers		
C-reactive protein	75 (41.9%)	15(8.38%)
Erythrocyte sedimentation rate	66(36.87%)	9(5.03%)
D-dimer	80 (44.69%)	15(8.38%)
Fibrinogen	74 (41.34%)	6(3.35%)
Ferritin	39 (21.79%)	16(8.94%)
Elevated cardiac markers		
Troponin	3(1.68%)	2 (1.12%)
Hypoalbuminemia	45 (25.14%)	3(1.68%)
elevated liver enzymes	14(7.82%)	6(3.35%)
Elevated lactate dehydrogenase	55(30.73.52%)	5 (2.79%)
Imaging findings		
Echocardiogram		
Decreased left ventricular function	33 (18.44%)	5 (2.79%)
Coronary artery dilation/aneurysm	0(0.0%)	0 (0.0%)
Other findings can include mitral regurgitation and pericardial effusion	1(0.56%)	0 (0.0%)
Chest radiograph		
Normal	0 (0.0%)	0 (0.0%)
Abnormal findings included small pleural effusions, patchy consolidations, focal consolidation, and atelectasis	81(45.25%)	5 (2.79%)
Chest CT		
Normal	0 (0.0%)	0 (0.0%)
Abnormal findings included small pleural effusions, patchy consolidations, focal consolidation, and atelectasis	80(44.69%)	6(3.35%)
nodular ground-glass opacification	162 (100%)	17100%)
Abdominal imaging (ultrasound and CT)		
including free fluid, ascites, bowel and mesenteric inflammation, including terminal ileitis, mesenteric adenopathy/adenitis	3 (1.68%)	0 (0.0%)

Table-4: Demographic data and characteristics of PICU admittance among non-survivors' cases

Variable [Total no of non-survivors' n=41\179 (15.22%)]		Suspected cases with negative COVID-PCR or not done: n = 37/179 (20.67%)	Confirmed cases n (%) = 4/179 (2.23%)
Age	< 60 days	7 (3.91%)	1(0.56%)
	60 days to < 5 years	12(6.70%)	2 (1.12%)
	5 years to < 12 years	15(8.38%)	1(0.56%)
	> = 12 years	3 (1.68%)	1(0.56%)
Sex (n %)	Female	21(11.73%)	1(0.56%)
	Male	16(8.94%)	3(1.68%)
Underweight (< 5th percentile)		20(11.17%)	3(1.68%)
Average weight (5–90th percentile)		12(6.70%)	1(0.56%)
Overweight (90–95th percentile)		4 (2.23%)	0(0%)
Obese (> 95th percentile)		1 (0.56%)	0(0%)
History of chronic disease and comorbidities (before PICU admission)	None	2 (1.12%)	0(0%)
	Rheumatic heart disease	1 (0.56%)	0(0%)
	Congenital heart disease	5 (2.79%)	0(0%)
	Diabetes mellitus	2 (1.12%)	1(0.56%)
	Respiratory disorders	11 (6.15%)	0(0%)
	Metabolic disorder	4 (2.23%)	1(0.56%)
	Neurological disorders	10 (5.59%)	1(0.56%)
	Renal disorders	2 (1.12%)	1(0.56%)

MV: mechanical ventilation, PEEP: positive end-expiratory pressure, IQR: interquartile range, pSOFA: Pediatric sequential organ failure assessment, PELOD-2 Paediatric Logistic Organ Dysfunction 2 Score, DKA: diabetic ketoacidosis, GE\PEM: gastroenteritis \protein energy malnutrition

All over the hospital care, 21 (0.5%) of the hospital's healthcare staff got an infection and had documented COVID-19 PCR positive by nasopharyngeal swab. The infection did not spread to other non-COVID parts of the hospital. Also, we did not document any transmission of the infection to other non-covid areas in the hospital.

4- DISCUSSION

Early identification of SARS-CoV-2-infected children at risk of developing severe COVID-19 is vital for service planning, as severely affected pediatric patients require high-quality care. They should be followed only where an adequately structured PICU is available. However, early identification of children at high risk of becoming severely affected by COVID-19 is challenging. Many challenges remain unmet in hospitals in areas where the pandemic has wreaked havoc; they include the speed of transmission, a lack of accurate knowledge about the benefits and drawbacks of currently available therapies, and the uncertainty of being able to provide adequate care if the rate of transmission continues. As the pandemic progresses, it is important to keep accessible critical care facilities for patients who aren't COVID-19 cases, protect healthcare workers, and assist with triaging ethical and societal consequences. In terms of available resources, we increased PICU capacity.

For critically ill patients, we used alternate areas and devised detailed arrangements to use existing monitored beds (e.g., hematology units, endocrine care units, and other intermediate care units). The cohorts of confirmed cases were admitted in specified areas only. While many researchers support this, it has also been proposed that the prioritization of PICU services, when faced with a number of critically ill pediatric patients, is justified, and proper ethical considerations must be given to guarantee that all children receive equitable treatment (22, 24). Furthermore, healthcare systems must strike a balance between saving the lives of the most vulnerable and prioritizing treatment based on the probability of clinical benefit (20). The Infection Prevention and Control responsibilities and protocols were created to prevent the spread of COVID-19 from children in other department units to healthcare workers. We established an infection prevention strategy complied with all CDC recommendations to avoid spreading infection (17, 19). Although 21 (0.5% of the HCWs) were infected, no infections were transmitted to other non-COVID parts of the hospital. An internal reporting system was established within our facilities, and the public health authorities were contacted. We implemented various systems and procedures to enhance staff situational awareness of patients with suspected or confirmed SARS-CoV-2 infection, including infection control, clinical laboratory, and frontline personnel. Specific personnel contacted government officials and disseminated information to healthcare workers. According to Egyptian Ministry of Health protocols, children with serious or critical illnesses were admitted into the isolated wards in intensive or intermediate care units. For these children, the foundation of treatment is supportive care (e.g., respiratory support, fluid and electrolyte support, and cytokine release syndrome monitoring) (19). We admitted 179 patients to our PICU isolation unit during the research period. We screened all cases that came to our emergency department and required PICU admission. The screening depended on CT (i.e. Ground glass appearance) and CBC (i.e. lymphopenia) findings categorizing the patients as either suspected or not; and we isolated the suspected cases in separate rooms until the results of PCR (19). During the study period, 17 (9%) patients' had positive results for Covid and were categorized as Confirmed cases, while 137 (76.5%) patients had negative COVID-PCR, and for 25 (13.97%) patients PCR was not done due to either early mortality or unavailability of the test at that time. Since tests are never reliable, they are considered imprecise, and consequently, no "gold standard" technique exists. However, SARS-CoV-2 infection can still be ruled out by negative SARS-CoV-2 test results (22, 23). Retrospectively, no positive test for infection may always indicate an infection. The likelihood of obtaining a false-negative PCR result for SARS-CoV-2 sampling and technical factors relies on various parameters. However, the possibility of obtaining a true positive result is reduced as the viral titer falls in line with declining viral concentrations in clinical specimens (21-24). Primarily, false-positive tests relate to an infection indicated when the test result is positive. In contrast, false-negative tests indicate that individuals are "uninfected," even though they are infected. A common reason for false-negative Ag-RDT testing is that inadequate clinical specimens, inhibitors, and antigen degradation may be involved. Among the patients who required intensive care admission, 111 (62.01%) required inotropic support and 80 (44.7%) needed mechanical ventilation support, reflecting organ dysfunction development, indicating that symptomatic pediatric patients are at risk of critical illness. Among the signs leading to PICU admission in our study, the most common

one was hemodynamic instability (39.66 %) followed by respiratory failure (32.96 %). The rates of comorbidity in our PICU cohort presence of chronic pulmonary diseases were 11.73% and 1.12% for suspected and confirmed patients, respectively. Among pediatric patients with Coronaviridae-variant strains, comorbid pulmonary illness and immunocompromised conditions have been associated with more severe disease. Further, our data indicate that healthy children can also suffer from severe manifestations of COVID-19 but at lesser rates than those with chronic medical conditions. Comorbidities in pediatric populations are not adequately understood and/or not common. Therefore, further studies on the impact of comorbidities on disease severity and the prevalence of symptomatic disease in pediatric populations are needed. Studies evaluating the factors predicting severe pediatric COVID-19 have shown that younger age, pre-existing underlying chronic severe comorbidities, male sex and lower respiratory tract infection signs and symptoms at presentation could be considered risk factors for PICU admission (11, 12, 25). Nevertheless, the prevalence of these characteristics varies greatly among PICU patients. More than 70% of the children with severe diseases in the research investigations were found to have additional medical conditions. Over half of PICU cases did not have an underlying condition in European research. Although it may not be the only factor capable of leading to complications and the deterioration of the clinical picture, it is still possible that an underlying comorbidity could be a risk factor for severe COVID-19 in children. WBC, platelet count, CRP, and ferritin were examined in relation to admission to the PICU and the development of organ dysfunction in preparation for the study. PICU admission and organ dysfunction were both associated with increased CRP on hospital presentation. Future research on CRP, WBC, and thrombocytopenia would be of value. The mortality rate in our cohort was (20.67%) for Suspected cases with negative COVID-PCR or not done and (2.23%) for Confirmed cases. Patients with comorbidities had a greater risk of mortality. One significant finding is the association between the mortality of patients and respiratory / neurological comorbidities (6.15%). As demonstrated by larger studies, comorbidities are associated with mortality in pediatric patients (31, 33). This is also shown in our cohort. Congenital heart disease, respiratory diseases, and cerebral palsy are often diagnosed comorbidities routinely encountered in pediatric critical care units. All the patients who died in our study had comorbidity and similar conditions to those described in a large series (15, 20). Substantial increases in serum CRP and WBC were found in our PICU group. Elevations in CRP are linked to severe pediatric sepsis and septic shock mortality. Higher CRP levels were linked with mortality in adult COVID-19 cohort participants from China, while MV was associated with death in pediatric COVID-19 cohort participants (29, 30). Since the management of pediatric critical care patients was centralized in one center, the patients included in our study were the sickest patients. The latter were hospitalized in our location, especially during the first two months of the pandemic. The patients presented in emergency departments (EDs) requiring critical care stayed in an observation area in ED until a bed was available in the COVID-19 unit. The transfer of the patient was possible. This is because there is no reliable information on the amount of time that must pass before a bed becomes available in the COVID-19 unit, which results in an extremely high death rate for patients who cannot be immediately admitted to a PICU. The morbidity and mortality of patients who did not die in a

pediatric critical care unit cannot be fully understood without a larger pediatric epidemiological investigation. While the method of admission (ED or referring ED) and the origin of reference were not studied, whether or not mortality was affected is unknown.

4-1. LIMITATIONS OF THE STUDY

The results of this study only include COVID-19 children admitted to PICU and do not represent the whole population. Also, they are restricted to one center.

5- CONCLUSIONS

Our PICU strategies and preparation ensured adequate prevention of infection spreading to other units and HWCs, lowering mortality and improving COVID-19 patients' outcomes. More research is crucially required to fill knowledge gaps in COVID-19 clinical disease courses, prognostic markers, and outcomes.

6- CONFLICTS OF INTEREST

None.

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