



PROFILES, TREATMENTS, OUTCOMES AND RISK FACTORS OF PEDIATRIC PATIENTS WITH COVID-19 SEEN IN A TERTIARY HOSPITAL IN BAGUIO CITY

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BACKGROUND OF THE STUDY

Coronavirus disease 2019 (COVID-19) is arguably one of the greatest health crises recorded in history. The impact of COVID-19 has been widespread, and throughout the year since this pandemic, it is noteworthy that infants and children have not been featured prominently in case statistics with only a few published local reports of COVID-19 in children.

With the relatively limited publicly available local data, this research aims to recognize and provide the profiles of children with COVID-19 in Baguio City, which can help us identify the population of children at risk of developing the disease as well as those at risk of having a severe or critical illness which can aid in early recognition and intervention.



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OBJECTIVES

GENERAL OBJECTIVE

To determine the profiles, outcomes, treatments, adverse events secondary to treatment, and risk factors of pediatric patients with COVID-19 in a tertiary hospital in Baguio City.

SPECIFIC OBJECTIVE

1. To determine the profiles of pediatric patients with confirmed COVID-19 according to severity based on: demography, epidemiology, clinical, diagnostic and others.
2. To determine the treatment given based on severity of COVID-19 as to: antimicrobial and adjunct therapy use and ventilatory support.
3. To determine the different adverse events secondary to treatment specific for COVID-19 (Remdesivir, Dexamethasone) given such as transaminitis (elevated AST/ALT), acute kidney injury (elevated serum creatinine), hyperglycemia, and others.
4. To determine the clinical outcomes of pediatric patients with confirmed COVID-19.
5. To determine the associated risk factors in developing severe and critical COVID-19 in admitted pediatric patients.

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METHODOLOGY

This is a **retrospective cross-sectional study** through a review of records of pediatric patients seen in a tertiary hospital from **June 2020 to May 2022**.

STUDY POPULATION:

INCLUSION CRITERIA	EXCLUSION CRITERIA
<ul style="list-style-type: none">➤ 0-18 years old➤ Positive SARS-CoV2 RTPCR➤ Seen at the ER, whether admitted or as outpatient	<ul style="list-style-type: none">➤ Incomplete charts/record➤ Missing charts/record

METHODOLOGY

SAMPLING

The study utilized a **total enumeration** sampling technique, which included 405 patients. Among these, a total of **389 patients** were included in the study.

STATISTICAL ANALYSIS

Descriptive statistics were used, and results were presented in **frequencies, percentages, median, and ranges** to describe the demographic, epidemiologic, and clinical profiles. Identification of risk factors for disease severity was done using **logistic regression analysis**. A $p\text{-value} < 0.05$ was considered significant. Data was analyzed using Epi Info (version 3.5).

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RESULTS

Majority of cases were between the **ages 1-5 years old (31.9%)**.
The proportion of **males** was higher (59.9%).
The greatest source of transmission was living in the same household accounting for 66.8% of cases, with **known** contact with a covid-19 confirmed person (77.1%), and with **no history of travel** noted (95.1%).
Most cases were **unvaccinated** (96.9%).

Profiles	Frequency (n=389)	Percentage (%)
Demographics		
AGE		
< 1 year old	106	27.2
1- 5 years old	124	31.9
6-10 years old	62	15.9
11-15 years old	60	15.4
>15 years old	37	9.5
SEX		
Male	233	59.9
Female	156	40.1
Epidemiologic		
EXPOSURE SETTING		
household	260	66.8
outside household	129	33.2
HISTORY OF TRAVEL		
Yes	19	4.9
No	370	95.1
CONTACT WITH POSITIVE PATIENT		
known contact	300	77.1
unknown contact	89	22.9
VACCINATION STATUS		
Complete Vaccination	6	1.5
Incomplete Vaccination	6	1.5
Unvaccinated	377	96.9

Table 1-A. Demographic and Epidemiologic Profile of Confirmed Pediatric COVID-19 Patients (N=389)

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RESULTS

	Total N=389 (%)	Asymptomatic n=147 (%)	Mild n=132 (%)	Moderate n=62 (%)	Severe n=26 (%)	Critical n=22 (%)
Presenting Symptoms						
None	152 (39.07)	144 (98.0)	4(3)	4 (6.5)	0 (0)	0 (0)
Fever	137 (35.22)	0 (0)	65(49.2)	37 (59.7)	21 (80.8)	14 (63.6)
Cough	127 (32.65)	0 (0)	56(42.4)	40 (64.5)	18 (69.2)	13 (59.1)
Difficulty of breathing	37 (9.51)	0 (0)	1 (0.8)	6 (9.7)	13 (50)	17 (77.3)
Colds	64 (16.45)	0 (0)	42 (31.8)	14 (22.6)	7 (26.9)	1 (4.5)
Headache	6 (1.54)	0 (0)	3 (2.3)	1 (1.6)	2 (7.7)	0 (0)
sore throat	11 (2.83)	0 (0)	8 (6.1)	3 (4.8)	0 (0)	0 (0)
watery stools	18 (4.63)	0 (0)	10 (7.6)	6 (9.7)	1 (3.8)	1 (4.5)
Vomiting	19 (4.88)	1 (0.7)	14 (10.6)	1 (1.6)	2 (7.7)	1 (4.5)
poor suck/intake	46 (11.83)	2 (1.4)	23 (17.4)	10 (16.1)	7 (26.9)	4 (18.2)
abdominal pain	17 (4.37)	3 (2.0)	10 (7.6)	2 (3.2)	0 (0)	2 (9.1)
Seizure	25 (6.42)	0 (0)	16 (12.1)	5 (8.1)	2 (7.7)	2 (9.1)
Myalgia	7 (1.80)	0 (0)	3 (2.3)	2 (3.2)	2 (7.7)	0 (0)
Others:						
Co-morbidities						
None	275 (70.69)	118 (80.3)	102 (77.3)	37 (59.7)	9 (34.6)	9 (40.9)
Bronchial Asthma	7 (1.80)	0 (0)	0 (0)	4 (6.5)	1 (3.8)	2 (9.1)
Tuberculosis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Cardiovascular Disease	12 (3.08)	2 (1.4)	1 (0.8)	2 (3.2)	3 (11.5)	4 (18.2)
Hematologic Disease	2 (0.51)	0 (0)	1 (0.8)	0 (0)	1 (3.8)	0 (0)
Renal Disease	6 (1.54)	2 (1.4)	2 (1.5)	1 (1.6)	1 (3.8)	0 (0)
Neurologic Disease	23 (5.91)	1 (0.7)	9 (6.8)	3 (4.8)	4 (15.4)	6 (27.3)
Endocrine Disease	5 (1.28)	1 (0.7)	0 (0)	0 (0)	3 (11.5)	1 (4.5)
Obesity	6 (1.54)	0 (0)	0 (0)	1 (1.6)	4 (15.4)	1 (4.5)
Malnancy	28 (7.19)	11(7.5)	10 (7.6)	6 (9.7)	1 (3.8)	0 (0)
Prematurity	8 (2.06)	0 (0)	0 (0)	3 (4.8)	1 (3.8)	4 (18.2)
Others:						

Co-infections						
None	332(85.35)	144 (98.0)	111 (84.1)	48 (77.4)	17 (65.4)	12 (54.5)
Typhoid	2 (0.51)	0 (0)	2 (1.5)	0 (0)	0 (0)	0 (0)
Dengue	15 (3.86)	0 (0)	10 (7.6)	3 (4.83)	1(3.8)	1 (4.5)
Others:						
Amebiasis	5 (1.29)	0 (0)	4 (3)	1 (1.6)	0 (0)	0 (0)
Atopic Dermatitis	1 (0.26)	0 (0)	0 (0)	1 (1.6)	0 (0)	0 (0)
Brain Abscess	1 (0.26)	0 (0)	0 (0)	0 (0)	1(3.8)	0 (0)
Cellulitis	1 (0.26)	1 (0.7)	0 (0)	0 (0)	0 (0)	0 (0)
Empyema Thoracis	1 (0.26)	0 (0)	0 (0)	0 (0)	1(3.8)	0 (0)
Encephalitis	1 (0.26)	0 (0)	1 (0.8)	0 (0)	0 (0)	0 (0)
HCAP	3 (0.77)	0 (0)	0 (0)	0 (0)	0 (0)	3 (13.6)
MAP	1 (0.26)	0 (0)	0 (0)	0 (0)	0 (0)	1 (4.5)
Meningitis	1 (0.26)	0 (0)	0 (0)	1 (1.6)	0 (0)	1 (4.5)
Meningoencephalitis	1 (0.26)	0 (0)	0 (0)	0 (0)	0 (0)	1 (4.5)
Pyomyositis	1 (0.26)	1 (0.7)	0 (0)	0 (0)	0 (0)	0 (0)
Sepsis	14 (3.60)	0 (0)	0 (0)	5 (8.1)	5 (19.2)	4 (18.2)
TB	1 (0.26)	0 (0)	0 (0)	1 (1.6)	0 (0)	0 (0)
Tetanus	1 (0.26)	0 (0)	0 (0)	1 (1.6)	0 (0)	0 (0)
UTI	5 (1.29)	1 (0.7)	3 (2.3)	1 (1.6)	0 (0)	0 (0)
Ventriculitis	1 (0.26)	0 (0)	1 (0.8)	0 (0)	0 (0)	0 (0)

Table 1-B Clinical profile of pediatric patients with confirmed covid 19 based on Disease Severity (N=389)

Most were asymptomatic.

Most common symptoms: **Fever and Cough** (mild to severe), **DOB** (critical)

Most common coinfection: **Dengue**

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RESULTS

Diagnostic test	Total N=389	Asymptomatic n=147	Mild n=132	Moderate n=62	Severe n=26	Critical n=22
	Median (Range)					
COMPLETE BLOOD COUNT						
Not done	38	26	7	1	0	4
Hemoglobin (g/L)		131 (119)	132(160)	129 (142)	129 (92)	131(102)
Hematocrit (L/L)		0.37 (0.33)	0.39 (0.34)	0.38 (0.4)	0.385 (0.27)	0.385 (0.32)
White Blood Cells (x10 ⁹ /L)		8.71 (21.05)	7.59 (30.03)	8.72 (24.37)	6.39 (19.35)	11.47(27.11)
Neutrophils (%)		36 (86)	48 (82)	40 (83)	49 (61)	59 (84)
Lymphocyte (%)		51 (83)	41 (78)	43 (75)	37 (59)	31 (86)
Platelet (x10 ⁹ /L)		333 (934)	285 (978)	308 (720)	250 (323)	301 (986)
INFLAMMATORY MARKERS						
Not done		121 (31.11)	125 (32.13)	61 (15.68)	26(6.68)	18 (4.62)
Procalcitonin (ng/mL)		-	0.13 (0.46)	-	0.16 (98.9)	0.3 (37.75)
CRP (mg/dL)		0.44 (41.57)	2.72 (25.66)	5.12 (94.30)	17.41 (92.86)	3.67 (94.88)

Table 1-C.1. Diagnostic profile of pediatric patients with confirmed covid 19 based on Disease Severity (CBC and Inflammatory Markers) N=389

Diagnostic test	Total N=389(%)	Asymptomatic n=147(%)	Mild n=132(%)	Moderate N=62(%)	Severe n=26(%)	Critical n=22(%)
CHEST XRAY						
Not done	58 (14.91)	33(22.5)	22 (16.7)	0 (0)	0 (0)	3 (13.6)
Abnormal	156 (40.10)	17 (11.5)	42 (31.8)	54(87.1)	24 (92.3)	19 (86.4)
Normal	175 (44.99)	97(66)	68 (51.5)	8(12.9)	2 (7.7)	0 (0)
CULTURE STUDIES						
Not done	347 (89.20)	146(99.3)	125(94.7)	51 (82.2)	17 (65.4)	8 36.4)
Negative Blood Culture	40 (10.28)	1 (0.7)	7 (5.3)	10 (16.1)	9 (34.6)	13 (59.1)
Positive Blood culture	2 (0.51)	0 (0)	0 (0)	1 (1.6)	0 (0)	1 (4.5)
Positive ET culture	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 1-C.2 Diagnostic profile of pediatric patients with confirmed covid 19 based on Disease Severity (Chest Xray and Culture) N=389

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RESULTS

Treatment	Total N=389 (%)	Asymptomatic n=147(%)	Mild n=132(%)	Moderate n=62(%)	Severe n=26(%)	Critical n=22(%)
ANTIMICROBIAL THERAPY						
None	294 (75.6)	147 (100)	118 (89.4)	22 (35.5)	1 (3.8)	6 (27.3)
Antiviral						
Oseltamivir	3 (0.8)	0 (0)	1 (0.8)	1 (1.6)	1 (3.8)	0 (0)
Remdesivir	29 (7.4)	0 (0)	0 (0)	2 (3.22)	18 (69.2)	9 (40.9)
Antibacterial						
Ceftriaxone	34 (8.7)	0 (0)	8 (6.1)	14 (22.6)	7 (26.9)	5 (22.7)
Azithromycin	10 (2.6)	0 (0)	2 (1.5)	7 (11.3)	1 (3.8)	0 (0)
Others	33 (8.5)	0 (0)	3 (2.3)	18 (29)	5 (19.2)	7 (31.8)
ADJUNCT THERAPY						
None	244 (62.7)	41 (27.9)	122 (92.4)	57 (91.9)	12 (46.2)	12 (54.5)
Dexamethasone	36 (9.3)	0 (0)	0 (0)	3 (4.8)	21 (80.8)	12 (54.5)
Zinc So4	288(74)	106 (72.1)	118 (89.4)	46 (74.2)	13 (50)	5 (22.7)
Multivitamins	235 (60.4)	106 (72.1)	87 (65.9)	36 (58.1)	3 (11.5)	3 (13.6)
Lagundi Syrup	39(10)	0 (0)	21 (15.9)	14 (22.6)	3(11.5)	1 (4.5)
IVIG	2(0.5)	0 (0)	0 (0)	0 (0)	1(3.8)	1 (4.5)
OXYGEN THERAPY						
None	304 (78.1)	147 (100)	120 (90.9)	37 (59.7)	0 (0)	0 (0)
Invasive	29 (7.5)	0 (0)	1 (0.8)	1 (1.6)	6 (23.1)	21 (95.5)
Non-Invasive	56 (14.4)	0 (0)	11 (8.3)	24 (38.7)	20 (76.9)	1(4.5)

Table 2. Treatment given to pediatric COVID patients based on Disease Severity (N=389)

Adverse Events	Total N=65 (%)	Remdesivir n=29 (%)	Dexamethasone n=36 (%)
NONE	32 (49.2)	13 (44.8)	19 (52.8)
Elevated AST/ALT	24 (36.9)	12 (41.4)	12 (33.3)
Elevated serum Creatinine	2 (3.1)	1 (3.4)	1 (2.8)
Hyperglycemia	7 (10.8)	3 (10.4)	4 (11.1)
Others	0 (0)	0 (0)	0 (0)

Table 3. Adverse Events Secondary to Treatment Specific for COVID-19

Outcomes	Total N= 389 (%)	Asymptomatic n=147(%)	Mild n=132(%)	Moderate n=62(%)	Severe n=26 (%)	Critical n=22(%)
Discharged/ Improved	349 (89.7)	142 (96.5)	117 (88.6)	58 (93.6)	22 (84.6)	9 (40.9)
Transferred to Isolation Facility	23 (5.9)	5 (3.5)	15 (11.4)	3 (4.8)	0 (0)	1 (4.6)
Mortality	17 (4.4)	0 (0)	0 (0)	1 (1.6)	4 (15.4)	12 (54.5)

Table 4 Clinical Outcomes of Pediatric Patients with Confirmed COVID-19 based on Disease Severity (N=389)

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RESULTS

Increased risk of severe COVID in:
Unvaccinated, Obesity, Co-infection

Increased risk of Critical COVID in:
Comorbidities (asthma, neurologic disease, prematurity)
Co-infection

Risk Factors	OR	95% CI	P value
Sex			
Male	1.668	0.762, 3.654	0.201
Female			
Age			
< 1 year old	Reference group		
1- 5 years old	0.673	0.190, 2.382	0.540
6-10 years old	0.347	0.088, 1.364	0.130
11-15 years old	0.569	0.133, 2.426	0.446
>15 years old	0.917	0.241, 3.491	0.899
Vaccination Status			
Complete Vaccination	Reference group		
Incomplete Vaccination	1.00	0	1.0
Unvaccinated	124622520.71	0	1.0
Comorbidities			
Bronchial Asthma	1.429	(0.080, 25.388)	0.808
Tuberculosis	-	-	-
Cardiac Disease	4.496	0.286, 70.817	0.285
Hematologic Disease	0.00	0.000, -	0.999
Renal Disease	6.535	0.670, 63.691	0.106
Neurologic	5.254	1.475, 18.710	0.010
Endocrine	4.695	0.471, 46.813	0.187
Malignancy	0.968	0.120, 7.824	0.976
Obesity	40.531	12.36, 269.040	<0.001*
Prematurity	3.701	0.417, 32.873	0.237
Others			
Appendicitis	0.00	0.00, -	0.999
Chronic Gastritis	0.00	0.00, -	0.999
Cleft Palate	0.00	0.00, 0	1.00
Downs Syndrome	20.576	1.00, 423.428	0.05
Fracture	0.00	0.00, -	0.999
inguinal Hernia	0.00	0.00, -	1.00
Intestinal Atresia	0.00	0.00, -	1.00
Low Birth Weight	0.00	0.00, -	1.00
Neonatal Cholestasis	0.00	0.00, -	1.00
Obstructive Jaundice	0.00	-	1.00
Overweight	15.970	108.797	0.005
SAM	0.00	-	1.000
SBO	0.00	-	1.00
SLE	0.00	-	1.00
VACTERL	0.00	-	1.00
Co-infections			
Typhoid	0.00	0.00, -	0.999
Dengue	0.835	0.102, 6.683	0.866
Others	5.133	2.131, 12.363	<0.001

Table 5A. Risk Factors for Severe COVID-19 in Admitted Pediatric Patients

Risk Factors	OR	95% CI	P value
Sex			
Male	0.683	0.272, 1.715	0.417
Female			
Age			
< 1 year old	Reference Group		
1- 5 years old	0.320	0.097, 1.052	0.061
6-10 years old	0.488	0.129, 1.846	0.291
11-15 years old	0.331	0.070, 1.564	0.163
>15 years old	0.847	0.220, 3.262	0.809
Vaccination Status			
Complete Vaccination	Reference Group		
Incomplete Vaccination	-	-	-
Unvaccinated	26477826.31	0.00, -	0.998
Comorbidities			
Bronchial Asthma	12.819	2,023, 81.25	0.007
Tuberculosis	-	-	-
Cardiac Disease	2.669	0,075, 94.567	0.590
Hematologic Disease	0	0, -	1.00
Renal Disease	0	0, -	0.999
Neurologic	9.922	34.781	<0.001
Endocrine	5.54	96.326	0.240
Malignancy	0.00	0, -	0.998
Obesity	2.564	0.85, 35.524	0.483
Prematurity	37.782	7.806, 179.019	<0.001
Others			
Appendicitis	0.00	0.00, -	0.999
Chronic Gastritis	0.00	0.00, -	0.999
Cleft Palate	0.00	0.00, -	1.00
Downs Syndrome	9.34	0.247, 353.848	0.228
Fracture	0.00	0.00, -	0.999
inguinal Hernia	0.00	0.00, -	1.00
Intestinal Atresia	0.00	0.00, -	1.00
Low Birth Weight	0.00	0.00, -	1.00
Necrotia	0.00	0.00, -	1.00
Obstruction	0.00	0.00, -	1.00
Overweight	0.00	0.00, -	0.99
SAM	6086662221.9	0.00, -	1.00
SBO	22628165096	0.00, -	1.00
SLE	0.00	0.00, -	1.00
VACTERL	0.00	0.00, -	1.00
Co-infections			
Typhoid	0.00	0.00, -	0.999
Dengue	1.043	0.122, 8.895	0.969
Others	7.202	2.858, 18.148	<0.001

Table 5B. Risk Factors for Critical COVID-19 in Admitted Pediatric Patients

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CONCLUSION

- highest incidence of COVID-19 occurred in **1 -5 years old** occurring more in **males**, with positive contact within the household.
- Most patients were **asymptomatic**, with **fever and cough** being the most common manifestation among those who are symptomatic.
- Laboratory results **did not differ significantly** across subgroups.
- Treatment with Remdesivir and dexamethasone was given to severe and critical cases with only **minimal recorded side effects**.
- Majority of the cases were **discharged** improved with only 4.4% mortality recorded.
- Risk factors identified through this study that increase the risk include **neurologic disease and obesity** for severe COVID and **neurologic disease, bronchial asthma, and prematurity** for critical COVID.

RECOMMENDATION

- Since this was hospital-based, the study population where limited and may not be reflective of the overall situation of pediatric COVID-19 in the region.
- Further research involving a larger study population and multiple study sites may provide more details regarding this disease.
- This retrospective study design relied mainly on extraction of collected data and some expected variables were not available for inclusion, consequently causing considerable inconsistencies, which may have precluded demonstrating other significant associations among variables.
- More focused study on the different subsets of patients like the maternal-neonatal dyads, co-infection, co-morbidities, and COVID-19 vaccinated patients to further understand COVID-19 in these patients.