



Clinical Profile and Comorbidities in Children with Sars-Cov 2 Infection Admitted In A Dedicated Covid-19 Hospital

Dr. Muthu Vijaya Nathan D¹, Dr. Bela Verma², Dr. Amin Kaba³, Dr. Kriti nautiyal⁴

¹Assistant professor, ²Professor & Head of department, ^{3,4}Assistant professor
Department of Pediatrics, Grant Govt. Medical College and Sir J. J Group of Hospital, Mumbai

***Corresponding Author:**

Dr. Muthu Vijaya Nathan D

Assistant professor, Department of Pediatrics, GGMC and Sir J. J Group of Hospital, Mumbai

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Abstract

Background: There is limited information on the severity of covid-19 infection in children with comorbidities. We studied the effects of children with comorbidities on severity of covid-19 infection.

Objective: To study the clinical profile and outcomes in children with covid-19 infection and also the association of SARS-CoV-2 infection in children with comorbidities.

Methods: This is an observational, descriptive, comparative study of SARS-CoV-2 RT-PCR positive children admitted in dedicated covid-19 hospital from March 2020-June 2021, enrolled 150 children within age group of 0 month-12 years.

Results: Among 150 cases, most common age group was 2.1 years to 12 years (57.4%) and most of the cases were male (60.7%). The most common symptom was fever (75.4%) followed by cough (50.9%) and breathlessness (45.5%) followed by loose stool (24.6%). Within the sample of 150 cases, comorbidities were noted in 86 cases (57.3%). Moderate (16.3%) to severe (27.9%) illnesses was noted more commonly in children with comorbidities. The severity of disease had statistically significant association with comorbidities. Among comorbidities, majority of cases belonged to hematological disorder 16 cases (17.4%), followed by neonatal diseases 14 cases (15.2%), neurological disorders 11cases (12.0%) and renal disorders 10cases (10.9%). Significant association was found between presence of comorbidity and need for oxygen, inotropic support and intensive care need. Duration of hospital stay and mortality was substantially increased in cases with comorbidities. There were 10 deaths out of 10 deaths 9 cases had comorbidities (10.9%).

Conclusion: We conclude that majority of patients with some preexisting comorbidity require strict vigilance during treatment and intensive care.

Keywords: SARS-CoV-2, COVID-19, Children, Comorbidities, Severity

INTRODUCTION

Severe acute respiratory distress syndrome - corona virus 2 (SARS- CoV- 2) causes acute respiratory distress syndrome in children. The virus originated in China in the end of 2019 and spread to India by 2020. Since then, the virus has rapidly spread to cause Covid-19 pandemic. In India 24 million people are affected of which children less than 18 years contribute to 8.5% of reported cases [1, 2, 3, 4]. In the recent second wave in India, many children are also

affected, but in contrast to adult population, children present with milder disease and fewer deaths [5, 6, 8]. The hospitalization numbers have increased and many children with comorbidities are admitted [7]. In this study we have studied the demographic, clinical profile and outcome of SARS-CoV-2 in children, with a special focus on children with comorbidities. In present study we compared the outcome in previously healthy children with SARS-CoV-2 with the children

with comorbidities. The study was conducted in a dedicated Pediatric Covid-19 hospital Grant Government Medical College and Sir JJ group of hospitals, Mumbai.

AIMS AND OBJECTIVES:

- To study the clinical profile and outcome of children with SARS-CoV-2 infection admitted in a dedicated Covid-19 hospital.
- To study the association of SARS-CoV-2 infection in children with comorbidities.

MATERIALS AND METHODS: -

We conducted a retrospective study over a period of 15 months from March 2020 to June 2021. The study was done in department of Pediatrics, Grant Government Medical College and Sir JJ Group of Hospitals Mumbai, Maharashtra which was observational, descriptive, comparative study of SARS-CoV-2. The study included 150 inpatient cases from 0 month – 12 years of age with Covid-19 RTPCR positive status.

- **Study procedure:** The study is a Retrospective analysis study of a dedicated covid-19 hospital, conducted after appropriate IEC clearance (IEC-GGMC and JJH-No. IEC/PHARMA/RP/497/JULY/2021). One hundred and fifty SARS-CoV-2 RT-PCR positive cases were enrolled in the study, from March 2020 to June 2021. The case details were analysed and recorded in a proforma. The case record form contains details of the individual including demographic details, presenting complaints, treatment given, laboratory investigations and radiological investigations, complications occurred during the course of admission and outcome of in the form of death or discharged and duration of hospital stay.

The cases of SARS-CoV2 infected children were divided into mild, moderate, severe category by WHO Pediatric guidelines^[1]. Mild disease characterized by Spo2 >94%, fever, cough, sore throat, headache, no fast breathing, no lethargy, no seizure, no dehydration. Moderate disease characterized by Spo2 between 90-94% with fast breathing (age

based) and no signs of severe pneumonia and illness. Severe disease characterized by Spo2 <90%, lethargy, seizures, somnolence, severe pneumonia, sepsis, septic shock, ARDS or MODS.

➤ **STATISTICAL ANALYSIS:**

The data was processed and analysed using the IBM statistical packages for social sciences, SPSS software version 22. Shapiro-Wilk test was used to test for normality of the data. Results of continuous measurements were done as frequency, mean and standard deviation. Results of categorical measurements were done as numbers (%). Chi-square test was applied to measure the association in the various parameters among both the groups of previously healthy children and those with comorbidities.

RESULTS:

In the present study of 150 cases of children of age group 0 – 12 years, majority of the cases were in the age group of 2.1 years to 12 years [86 cases (57.4%)] followed by equal number of cases in age groups 0 months to 2 months [32 cases (21.3%)] and 2.1 months to 2 years [32 cases (21.3%)] (Table 1). Among the cases, 91 (60.7%) were male and 59 (39.3%) were females. (Table 2).

The presentation of cases at the time of admission included cases who were symptomatic 114 (76.0%) and asymptomatic 36 (24.0%) (Table 3). The symptoms varied in distribution, with fever seen as most common presenting symptom 86 cases (75.4%) followed by cough 58 (50.9%) and breathlessness 52 (45.6%). Out of 114(76%) symptomatic cases, 34(29.8%) presented with cold, 28 (24.6%) presented with loose stools, 21(18.4%) presented with lethargy, 19(16.7%) presented with vomiting, 12 (10.5%) presented with irritability, 9 (7.9%) presented with abdominal pain, altered sensorium and seizures. There were 4 (3.5%) cases that presented with sore throat, 3 (2.6%) with rash, body ache and headache each and 1 (0.9%) with conjunctival redness (Fig. 1).

Contact tracing was done for all the cases and the statistics showed that, 95 (63.3%) of the cases had positive history of COVID-19 contact, whereas 55

(36.7%) did not have history of COVID-19 contact. (Fig. 2).

Within the sample of 150 SARS-CoV-2 positive cases, 86 (57.3%) children had comorbidities and 64 (42.7%) were previously healthy (Fig. 3). Based on the clinically used severity scoring of COVID 19 symptoms by World Health Organization [1], in both previously healthy group of children 52 (81.3%) and children with comorbidities 48 (55.8%), group severity was mild in majority of the cases. In children with comorbidities group, 24 (27.9%) of the cases had severe COVID-19. Only 1(1.6%) case had severe disease in previously healthy children group. Thus the association was found to be **statistically significant**. (Table 4).

Of all the children with comorbidities infected with SARS-CoV-2, it was observed that majority of the cases had hematological comorbidities 16 (17.4%), followed by neonatal diseases 14 (15.2%) and neurological comorbidities 11 (12.0%). There were 10 (10.9%) renal disorders, 7 (7.6%) cases with surgical condition, heart disease and congenital heart disease and pulmonary tuberculosis each. There were 5 (5.4%) cases of malignancy. Out 86 cases with comorbidities, 3 (3.3%) had congenital anomalies and 2 (2.2%) had gastro intestinal and malnutrition each. 1 (1.1%) had endocrine, bronchial asthma and obesity each. (Fig. 4)

During the course of admission radiological investigations were done for all cases. The X ray investigation of the cases revealed that 92 (61.3%) had normal chest X-ray findings and 58 (38.7%) had abnormal chest X-ray findings. Out of 58 cases with abnormal chest X-ray findings, majority them had bilateral infiltrates 26 (17.3%) followed by consolidation 18 (12.0%) and upper infiltrates 9 (6.0%). (Table 5).

There was a **statistically significant** association between COVID – 19 positive cases with comorbidities and the need for intensive management. Of 55 (36.7%) cases that needed oxygen support, 41(47.7%) had comorbidities and 14(21.9%) were previously healthy. The oxygen support was provided by various methods according to the requirement of the case. Thirty one (20.7%) cases needed oxygen support by prongs, mask or hood; out of which 19(22.1%) cases had comorbidities and 12(18.8%) were previously healthy. There were 11(7.3%) cases

that required oxygen support by BCPAP, out of which 10 (11.6%) cases had comorbidities and 1 (1.6%) was previously healthy. Thirteen (8.7%) cases needed mechanical ventilation, 12(14.0%) cases had comorbidities and 1(1.6%) was previously healthy. There were 31(20.7%) cases that needed intensive care, of which 27(31.4%) cases had comorbidities and 4(6.3%) were previously healthy. Twenty-eight (18.7%) cases needed Inotropic support, of which 24 (27.9%) cases had comorbidities and 4(6.3%) were previously healthy. (Table 6, 7)

As depicted in table 8, cases that received antibiotic were 81 (54.0%); 50(58.1%) cases had comorbidities and 31(48.4%) cases were healthy. Thirty-three (22.0%) cases who were given Oseltamivir and 31 (20.7%) were given Azithromycin. With appropriate treatment and care, 140 (93.3%) of the cases were discharged; out of which 77 (89.5%) cases had comorbidities and 63(98.4%) cases were previously healthy. Forty (26.7%) cases required hospital stay of more than 10 days and 10 (6.7%) cases succumbed to the illness (Table 9).

DISCUSSION:

SARS-CoV-2 caused by Corona virus has rapidly spread in India and the world in the past 2 years and has involved cases of all age groups including the pediatric population [1, 2, 3]. Mumbai has been one of the most affected city in the country. Our dedicated covid-19 hospital received Covid positive cases from all over Maharashtra. The study was conducted in a group of 150 COVID-19 RTPCR positive children between 0 months -12 years where most cases were in age group of 2.1 years to 12 years 86 (57.4%), including 91 (60.7%) male and 59 (39.3%) females, with [86 (57.3%)] and without [64 (42.7%)] previously diagnosed comorbidities.

There was **significant association** between severity of disease and preexisting comorbidities such that in previously healthy cases, 12 (18.8%) had moderate to severe disease while 38 (44.2%) of cases with comorbidities had moderate to severe disease. Similarly, a study by **Sudha Rao et al. 2021** [6] noted that 18 (23.7%) of previously healthy individuals had moderate to severe disease, whereas 40(85.1%) cases with comorbidities had moderate to severe disease.

In our study most common presenting symptom was fever, followed by cough and breathlessness. A study published by **Vinod H. Ratageri et al. 2021** [10] also had statistics showing that out of 20 (29%) symptomatic cases, the most common symptom was fever 14 (70%), followed by cough 10 (51%) and difficulty in breathing 04 (20%).

In a study by **Karthi Nallasamy et al. 2020** [9] it was seen that primary source of infection for children was a household contact and that fever and respiratory symptoms predominated in the symptomatic children. This study also found that 13 cases (42%) were symptomatic, where 10 cases (32%) had fever and 9 cases (29%) respiratory symptoms. Similar findings were also observed in study by **Bustos-Cordova E et al. 2020** [14].

Among comorbidities in our study, the largest number had **hematological conditions** [16(17.4%) cases- Thalassemia-13, severe megaloblastic anemia with infantile tremor syndrome-1, severe iron deficiency anemia with heart failure-2] followed by second highest belonging to **neonatal diseases** [14 (15.2%) cases-prematurity-8, Hypoxic ischemic encephalopathy-2, Meconium aspiration syndrome -1, IUGR-1, Necrotising enterocolitis-1, Neonatal polycythemia-1]. The third highest being **neurological conditions** [11(12.0%) cases-Cerebral palsy-4, meningitis-2, Arnold Chiari malformation-1, Neurotuberculosis-1, Hydrocephalus with VP shunt in-situ-3].

Ten cases had **renal disorders** [10(10.9%) cases- Nephrotic syndrome-8, post streptococcal glomerulonephritis-1, acute bacterial pyelonephritis-1] and 7 (7.6%) **Surgical conditions** (Intussusception-1, Acute appendicitis with perforation-1, Subacute intestinal obstruction-1, Anorectal malformation with hypospadias-1, Bladder exstrophy with epispadias-1, Hydrocephalus-1, Late onset presentation of congenital diaphragmatic hernia-1).

Other comorbidities included **congenital heart disease and others** 7 (7.6%) cases-VSD-3, PDA-1, Atrioventricular septal defect-1, Tetralogy of Fallot-1, Pneumopericardium with infective endocarditis-1] and 7 (7.6%) cases of **pulmonary tuberculosis** (5 cases of Pulmonary tuberculosis, 1 case of Tubercular pleural effusion and 1 Miliary tuberculosis) and 5 (5.4%) cases of **malignancy** (Retinoblastoma-

3, Medulloblastoma-1, Acute lymphoblastic leukemia-1) and 3 (3.3%) had **congenital anomalies** (1-Down syndrome, 1-Edward syndrome, Triple x syndrome-1) and 2 (2.2%) cases from **gastrointestinal and liver disorders** (Neonatal cholestasis-2) and 2 (2.2%) cases of **Severe Acute Malnutrition** and 1 (1.1%) being **endocrine** (hypothyroidism) and 1(1.1%) cases of bronchial asthma and 1(1.1%) cases of obesity with 5 (5.4%) cases **miscellaneous conditions** (poisoning-1, HIV-1, Head injury with intracranial bleeding-1, second degree burns with sepsis with fracture of both bone forearm-1, Florid rickets with vitamin A deficiency-1). Some cases presented with overlapping comorbidities.

A similar finding was observed in a study conducted by **Sudha Rao et al. 2021** [6] where out of 38% cases with comorbidities, hematological disorder was most common followed by Congenital Heart disorder followed by renal disorders and Tuberculosis. **Lara S. Shekerdeman et al. 2020** [7] in their study of 48 children with COVID-19 admitted to participating PICUs, found that 40 cases (83%) had significant preexisting comorbidities maximum being Medically Complex -19 cases. Also study conducted by **Nivedita Pande et al. 2021** [5] had 30% cases with comorbidities with malignancy being the maximum followed by Tuberculosis and Congenital Heart diseases. **Even though the number of comorbidities was high the mortality rate was low in all studies** [5, 6, 7, 13].

The Chest X-ray findings were found normal in 92 (61.3%) cases and bilateral infiltrates was the most common finding in 26 (17.3%) cases. In a study by **Sarangi B et al. 2020** [11] chest X-ray was done in 20 (95.2%) of 21 symptomatic children. It was found to be normal in 18 (85.7%), while two showed bilateral lower zone haziness (<50%).

Due to lack of a fixed drug regimen for COVID, treatment included Antibiotics in 81 cases (54%), Azithromycin in 31 cases (20.7%) and Oseltamivir in 33 cases (22%) which was more frequently used in the treatment of cases with comorbidities. As there were limited recommendations and there is no clear recommendations and trials on drug therapy in children, we followed management protocols of WHO guidelines [1] and suggested also by **Sankar J et al. 2020** [11] which stated that management is mainly

supportive care. **Lara S. Shekerdeman et al. 2020** [7] in their study of 48 cases, mention hydroxychloroquine was used in 21(44%), Azithromycin was used in 8 cases (17%), Remdesivir and other antiviral therapy in 8 cases (17%) and 13 (28%) patients received combination therapy. In a study by **Nivedita Pande et al. 2021** [5] of 100 cases, antibiotics were used in 82 cases (82%), Oseltamivir in 51 cases (51%), Azithromycin in 41 (41%), steroids 9 (9%), IVIG in 2 (2%) and low molecular weight heparin in 1 case (1%).

There is a **statistically significant** association between presence of comorbidity and need for oxygen and inotropic support and intensive care. Parallel to this, in a study conducted in Wuhan by **Yang X et al. 2020** [15] presence of comorbidities in adults was found an important predictor of need for intensive care. Duration of stay and mortality was substantially increased in cases with comorbidities, with 9 deaths (neonatal diseases -3, MDR tuberculosis-2, Congenital anomaly -2, Malignancy -1 and Congenital heart disease -1) recorded in contrast to 1 (ARDS secondary to COVID-19 pneumonia) in previously healthy cases.

CONCLUSION:

The nationwide effect of COVID pandemic has resulted in dynamic change in our healthcare system but the lack of a standardized treatment plan and lack of sufficient infrastructure to manage the COVID-19 patient load has presented a serious problem during this pandemic. In our study we conclude that majority of patients of Pediatric age group with moderate to severe disease have some preexisting comorbidity and thus require strict vigilance during treatment and intensive care. Since there are no drugs to treat SARS-CoV-2 yet, and the vaccinations are not approved for this age group, treatment is still symptomatic and hence highly variable.

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TABLES:

Table 1: Distribution of cases according to age

Demographics		Number	Percentage
Age Groups(n=150)	0 month to 2months	32	21.3%
	2.1months to 2years	32	21.3%
	2.1years to 12 years	86	57.4%
	Total	150	100.0%

Table 2: Distribution of cases according to gender

Demographics		Number	Percentage
Gender(n=150)	Male	91	60.7%
	Female	59	39.3%
	Total	150	100.0%

Table 3: Distribution of cases according to presence of complaints			
		Number	Percentage
Presenting complaints (n=150)	Asymptomatic	36	24.0%
	Symptomatic	114	76.0%
Total		150	100.0%

Table 4: Association of severity of COVID-19 with presence of comorbidities				
Severity	COVID-19 Positive In Previously Healthy Children (n1=64)	COVID-19 Positive In Children With Comorbidities (n2=86)	Total (n=150)	P value
Mild	52(81.3%)	48(55.8%)	100(66.7%)	0.00* Significant
Moderate	11(17.2%)	14(16.3%)	25(16.7%)	
Severe	1(1.6%)	24(27.9%)	25(16.7%)	
Total	64	86	150(100%)	

Chi-square test; *Statistically significant, p<0.05

Table 5: Distribution of cases according to chest X-ray findings			
Chest X-ray findings(n=150)		Number	Percentage
Normal Chest X-ray findings		92	61.3%
Abnormal Chest X-ray findings (n3=58)	U/L Infiltrates	9	6.0%
	B/L Infiltrates	26	17.3%
	Consolidation	18	12.0%
	Pleural Effusion	2	1.3%
	Miliary	1	0.7%
	Mediastinal Lymphadenopathy	1	0.7%
	Left Lobe Of Diaphragm Elevated With Bowel Loops Entering Through It	1	0.7%
Total		150	100.0%

Table 6: Association of treatment with presence of comorbidities

Treatment	COVID-19 Positive In Previously Healthy Children (n1=64)	COVID-19 Positive In Children With Comorbidities (n2=86)	Total (n=150)	P value
Oxygen support	14(21.9%)	41(47.7%)	55(36.7%)	0.00* Significant
Need for intensive care	4(6.3%)	27(31.4%)	31(20.7%)	0.00* Significant
Inotropic Support	4(6.3%)	24(27.9%)	28(18.7%)	0.00* Significant

Chi-square test; *Statistically significant, p<0.05

Table 7: Distribution of cases based on the oxygen support

Treatment	COVID-19 Positive In Previously Healthy Children (n1=64)	COVID-19 Positive In Children With Comorbidities (n2=86)	Total (n=150)
Oxygen support by prongs, mask, hood	12(18.8%)	19(22.1%)	31(20.7%)
Oxygen support by BCPAP	1(1.6%)	10(11.6%)	11(7.3%)
Mechanical ventilator	1(1.6%)	12(14.0%)	13(8.7%)

Table 8: Distribution of cases based on the pharmacotherapy

Treatment	COVID-19 Positive In Previously Healthy Children (n1=64)	COVID-19 Positive In Children With Comorbidities (n2=86)	Total (n=150)
Need For Antibiotic	31(48.4%)	50(58.1%)	81(54.0%)
Azithromycin	14(21.9%)	17(19.8%)	31(20.7%)
Oseltamivir	14(21.9%)	19(22.1%)	33(22.0%)
Corticosteroids	1(1.6%)	10(11.6%)	11(7.3%)
Remdesivir	1(1.6%)	3(3.5%)	4(2.7%)
IVIG	0(0.0%)	2(2.3%)	2(1.3%)
Ivermectin	0(0.0%)	1(1.2%)	1(0.7%)
Doxycycline	0(0.0%)	1(1.2%)	1(0.7%)

Tocilizumab	0(0.0%)	0(0.0%)	0(0.0%)
Hydroxychloroquine	0(0.0%)	0(0.0%)	0(0.0%)
Low molecular weight Heparin	0(0.0%)	2(2.3%)	2(1.3%)

Table 9: Distribution of cases based on the outcome			
Outcome	COVID-19 Positive In Previously Healthy Children (n1=64)	COVID-19 Positive In Children With Comorbidities (n2=86)	Total (n=150)
Hospital stay >10 days	11(17.2%)	29(33.7%)	40(26.7%)
Discharged	63(98.4%)	77(89.5%)	140(93.3%)
Deaths	1(1.6%)	9(10.5%)	10(6.7%)

FIGURES/GRAPH:

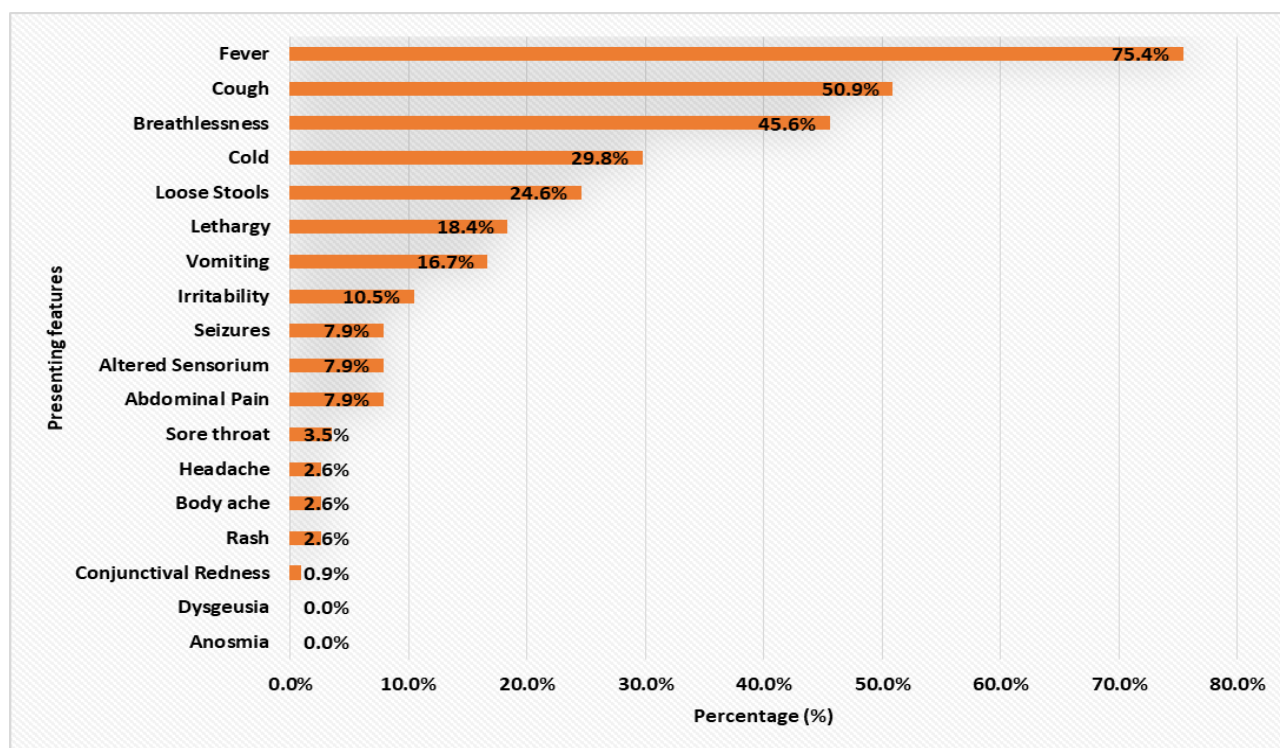


Figure 1: Distribution of cases according to presenting features.

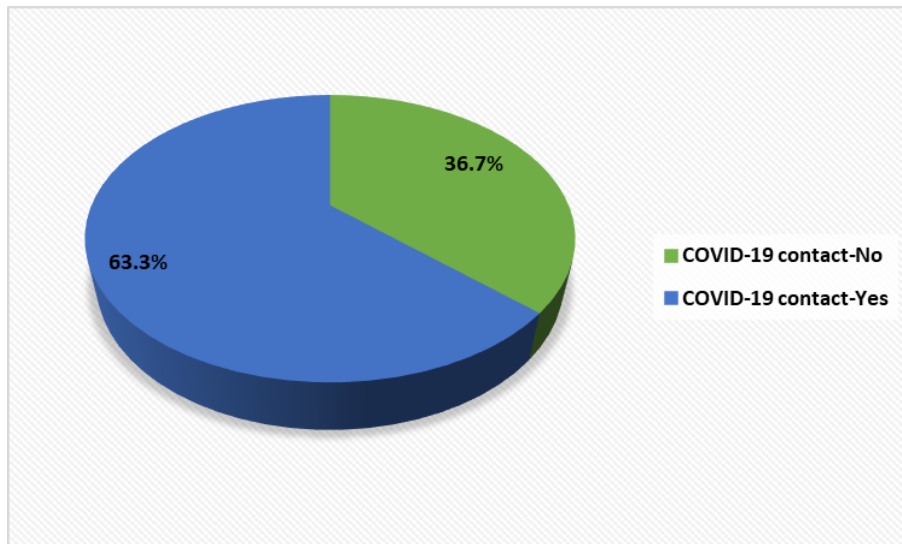


Figure 2: Distribution of cases according to history of COVID-19 contact

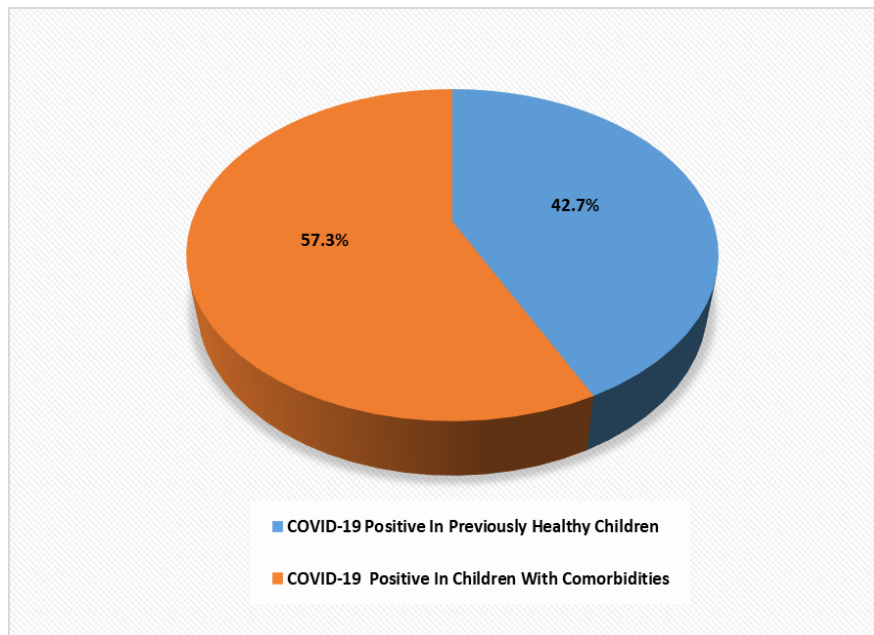


Figure 3: Distribution of cases based on presence of co-morbidities

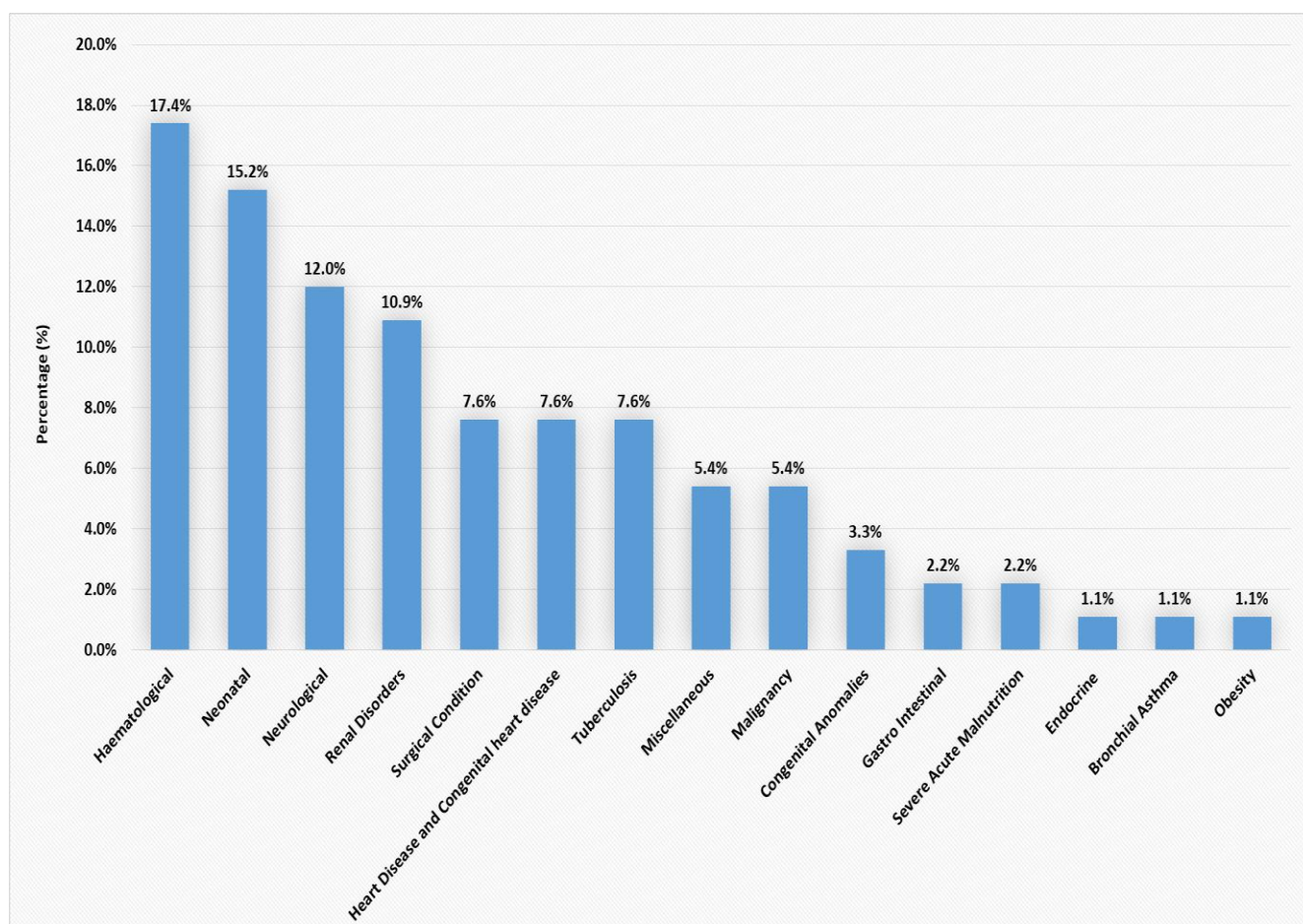


Figure 4: Distribution of cases according to presence of comorbidities