

Positivity Rate of SARS-COV-2 Using Reverse Transcription-Polymerase Chain Reaction Among Pediatric Population Admitted in a Tertiary Hospital in Southern Philippines

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Abstract

Background: Positivity rate is a measure used in public health surveillance to gauge the spread of disease and may be used as a guide in creating measures to minimize its extent. This study examines the change of positivity rate with the quarantine classification of Davao City, Philippines and appreciates its effect in the pediatric population. **Objectives:** To determine the Positivity Rate of COVID 19 infection among the pediatric population admitted at Southern Philippines Medical Center (SPMC) from March 2020-July 2021. **Methodology:** The study used a retrospective study design via chart review of all 0-18 years old admitted in SPMC as COVID 19 Confirmed from March 2020 to July 2021. Descriptive statistics was used in the analysis of the variables in this study. **Results:** Of the 913 patients included, majority were 12-18 years old (43.04%). Most had a known exposure to a covid-19 confirmed individual (59.46%), and were asymptomatic (38.08%) or mild (35.71%). The hospital had a positivity rate of 1.79%. The age group 12-18 years old had the highest positivity rate (1.79%). Changes in the positivity rate were noted with a change in the quarantine classification of the city. Most of confirmed cases (76.71%) were swabbed within 0-5 days from symptom onset. **Conclusion:** Pediatric patients are at risk for COVID-19, although most present with mild symptoms. The monthly positivity rate of SPMC changes depending on the quarantine classification of Davao City, with stricter quarantine classification showing negative percentage change. Early testing of pediatric patients with symptoms of COVID-19, ideally within 0-5 days from the onset of symptoms, is recommended for better detection and timely implementation of quarantine protocols.

Keywords: Positivity rate, Pediatric COVID-19, COVID-19

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1. Introduction

Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) has plagued the whole world over the past year. It has caused great damage not only on the health of individuals but on many industries and other aspects of life. As this virus is new, many things are yet to be discovered about it, and the data we have about it changes every day.

SARS-COV-2 is the causative agent of Coronavirus Disease (COVID-19) infection. Coronaviruses have been important pathogens in human and animal diseases. In December of 2019, a cluster of pneumonia cases was noted in Wuhan at the Hubei Province of China, and a novel coronavirus was noted to be the cause. Within a matter of weeks, it spread to neighboring provinces, resulting in an epidemic throughout China. This was followed by an increasing number of cases in other countries around the world. ³ The first case recorded in the Philippines was noted on January 20, 2020 with the first local transmission on March 7, 2020. ⁴ Department of Health data showed that in March 2021, there were 57,393 confirmed COVID-19 cases aged 19 years and below, of whom 51.3% were males. This data shows that the pediatric population accounts for 7.8% of the total infected population of COVID 19. Among the pediatric population, fever and cough are the most common symptoms and symptomatic cases are also noted. ¹ The most common mode of disease transmission is through respiratory droplets or by contact with mucosal surfaces, with an incubation period of 5-6 days, up to 14 days. ²

The disease presents differently in individuals and is more severe among the high-risk groups. Given its unpredictability, prevention is crucial rather than treatment. Early identification of the virus through Reverse Transcription-Polymerase Chain Reaction (RT-PCR) testing enables the identification and subsequent isolation of infected individuals, thereby minimizing its spread. Positivity rate is a measure for public health surveillance to gauge the spread of the disease and results may be used as a guide in creating measures to minimize the spread.

2. Methodology

A retrospective study design was used via chart review. All pediatric population 0-18 years old admitted to SPMC as confirmed COVID 19 cases from March 2020 to July 2021 were included through complete

enumeration. All subjects were selected through purposive sampling. The primary outcome of the study is to describe the positivity rate of pediatric patients admitted at SPMC from March 2020-July 2021 using RT-PCR. This includes demographics, timing of specimen collection and relationship of positivity rate and quarantine classification of Davao City at the time. Subject selection proceeded based on the admission list obtained from the Department of Pediatrics census. Descriptive statistics were used in the analysis of the variables. Frequency and percentages were used to describe the socio-clinico-demographic profile, which included age, sex, exposure history, case classification, and days from onset of symptoms to RT-PCR testing of the pediatric patients admitted to SPMC. Percent change was used to analyze the monthly positivity rate corresponding to its quarantine classification. Positivity rates across age groups and days from onset of symptoms to RT-PCR testing were also described graphically.

3. Results and Discussion

A total of 913 cases of COVID 19 from March 2020-July 2021 were included in the study. The total number of swabs taken per month was based on the SPMC Molecular Laboratory data.

Table 1: Age and sex distribution of COVID 19 Pediatric patients

| | Total Number (N=913) | Percentage |
|------------------|-------------------------|------------|
| AGE | | |
| 0-1 years old | 179 | 19.61% |
| 2-5 years old | 164 | 17.96% |
| 6-11 years old | 177 | 19.39% |
| 12-18 years old | 393 | 43.04% |
| Sex | | |
| Male | 471 | 51.59% |
| Female | 442 | 48.41% |
| Exposure | | |
| With Exposure | 542 | 59.36% |
| Without Exposure | 371 | 40.64% |

The general data shows that the largest group of COVID cases belong to ages 12-18 years old, accounting for 43.03% while patients less than 1 year old were the least admitted. The school-age children, 6-11 years old ranked second, while the toddlers aged 2-5 years old were third with 17.96%. (Table 1)

There was a slight male predominance at 51.59%, a 3.18% difference from the female pediatric population. Most of the patients had a known exposure from an adult who was also a confirmed COVID-19 case at 59.36%. (Table 1)

Table 2. Case Classification of Confirmed COVID 19

| Case Classification | Total Number | Percentage |
|---------------------|--------------|------------|
| Asymptomatic | 439 | 48.08% |
| Mild | 326 | 35.71% |
| Moderate | 98 | 10.73% |
| Severe | 31 | 3.40% |
| Critical | 19 | 2.08% |

Majority of the pediatric COVID-confirmed positives were asymptomatic (48.08%) or mild (35.71 %). This is followed by moderate at 10.73%. Of all admitted patients, only 5.48% were classified as severe or critical. A total of 32 pediatric patients died of COVID-19 from March 2020-July 2021 with a mortality rate of 3.50%. (Table 2)

Table 3. Positivity Rates of Pediatric Patients according to Age group

| Age Group (years) | Confirmed Positive | Positivity Rate |
|-------------------|--------------------|-----------------|
| 0 to 1 | 179 | 0.35% |
| 2 to 5 | 164 | 0.32% |
| 6 to 11 | 177 | 0.35% |
| 12 to 18 | 393 | 0.77% |
| Total: | 913 | 1.79% |

Approximately 2% of the pediatric patients tested for COVID-19 were positive. The teenage age group had the highest positivity with 0.77% while the positivity rate of patients aged 0 to 1 year old is 0.35%, 2 to 5 years old is 0.32%, and 6 to 11 years old is 0.35%. (Table 3)

Table 4. Monthly COVID-19 Positivity Rate of Pediatric patients admitted at SPMC with Monthly Quarantine Classification

| Month and Year | Pediatric Patients Confirmed Positive | Total Tested SPMC Patients | Monthly Positivity Rate | Percent Change in Positivity Rate | Monthly Quarantine Classification |
|----------------|---------------------------------------|----------------------------|-------------------------|-----------------------------------|-----------------------------------|
| March 2020 | 2 | 16 | 12.50% | - | GCQ |
| April 2020 | 4 | 118 | 3.39% | -72.88% | ECQ |
| May 2020 | 28 | 245 | 11.43% | 237.14% | GCQ |
| June 2020 | 22 | 537 | 4.10% | -64.15% | GCQ |
| July 2020 | 52 | 403 | 12.90% | 214.96% | MGCQ |
| August 2020 | 63 | 1995 | 3.16% | -75.53% | MGCQ |
| September 2020 | 60 | 2022 | 2.97% | -6.03% | MGCQ |
| October 2020 | 155 | 2834 | 5.47% | 84.32% | MGCQ |
| November 2020 | 136 | 3694 | 3.68% | -32.69% | GCQ |
| December 2020 | 48 | 4446 | 1.08% | -70.68% | GCQ |
| January 2021 | 62 | 4980 | 1.24% | 15.32% | GCQ |
| February 2021 | 33 | 3751 | 0.88% | -29.33% | GCQ |
| March 2021 | 15 | 2526 | 0.59% | -32.50% | GCQ |
| April 2021 | 15 | 3671 | 0.41% | -31.19% | GCQ |
| May 2021 | 51 | 5395 | 0.95% | 131.35% | GCQ |
| June 2021 | 84 | 8362 | 1.00% | 6.27% | MECQ |
| July 2021 | 83 | 6008 | 1.38% | 37.52% | MECQ |
| Total | 913 | 51003 | 1.79% | | |

In April 2020, quarantine protocol was changed from general community quarantine (GCQ) to enhanced community quarantine (ECQ), which showed a 72.88% decrease in positivity rate from 12.50% to 3.39%. In May 2020, GCQ was implemented, and 237.14% increase in positivity rate (11.43%) among pediatric patients was noted. Another notable increase (214.96%) in positivity rate was observed in July 2020 when modified general community quarantine (MGCQ) was imposed, from 4.10% to 12.90%. When GCQ was implemented in November 2020, there was a decrease (-32.69%) in positivity rate from 5.47% to 3.68%). The positivity rate continued to decline until April 2021. However, in May 2021, there was a 131.35% increase in the positivity rate. This affected the quarantine protocol in June 2021, when Davao City was placed under modified enhanced community quarantine (MECQ). (Table 4)

Table 5. Number of Days of Onset of Symptoms to Swabbing

| Number of Days from symptom onset to swab | Total Number | Percentage (N=474) | Positivity Rate (TT=51003) |
|---|--------------|--------------------|----------------------------|
| 0-5 days | 361 | 76.16% | 0.71 |
| 6-10 days | 72 | 15.19% | 0.14 |
| >10 days | 41 | 8.65% | 0.08 |

Of the 913 confirmed COVID-19 pediatric cases, 474 were asymptomatic. Results show that the highest percentage of symptomatic patients who tested positive were those whose RTPCR taken at 0-5 days from symptom onset while the least number of positives were those patients whose RTPCR taken more than 10 days. (Table 5)

COVID-19 infection in children account for only a small percentage of the infected population worldwide; however, this does not mean that its impact is lesser. The disease affects all age groups, and as shown in the study, COVID-19 pediatric admission at SPMC had the highest prevalence in the 12–18-year-old age group. The study’s results are comparable to a study conducted in Mexico among the population between 1 and 20 years old, where most cases were noted in 15–19-year-olds followed by those in the 10–14-year age group.²⁴ There is a slight preponderance in the male population afflicted with the disease as shown in the study at 51.59%, which is comparable to a Chinese study showing slightly more of the cases occurring in boys (56.6%) than in girls (43.4%).²⁵

Most of the admitted pediatric patients in SPMC had exposure to a confirmed COVID-19 case. Data inspection showed that, in most months, the patients had a known exposure from either their mother or father. However, in June 2021 and July 2021, more than half of the cases had no known exposure. A case-control study done in Mississippi revealed that close contact with a household member, having visitors at home, and attending gatherings with persons outside the household were associated with SARS-CoV-2 infection in children and adolescents.²⁶

Most of the admitted cases were noted to be asymptomatic or mild at 40.08% and 35.71% respectively. This is comparable to the national data on of December 2021, where half of the pediatric COVID 19 cases in the

Philippines were noted to be asymptomatic or mild at 17.1% and 41.9% respectively. SPMC, however had a lower percentage of moderate, severe and critical cases at 10.73%, 3.40%, and 2.08% respectively compared to the national data of 24.5%, 7.9% and 7.3%. The SPMC data also showed a lower mortality rate of 3.5% compared to the national data of 8.5%, basing on the Salvacion Registry.²⁷

The positivity rate of the pediatric population in SPMC is noted to be 1.79% during the study period. Positivity rate represents the percentage of patients who tested positive for SARS-CoV-2 relative to the total number of tests done. An increase in testing could mean that there is widespread infection in the community, only individuals at the greatest risk of infection within a community is being tested, or there are reporting processes delays that skew the results.²⁰ The age group with the highest positivity rate was noted to be under 12-18 years old. The infection rate of this age group is higher than that of younger age groups. A higher number of tests were also conducted in this age group. On review of their exposure status, majority of the population had exposure to a parent or neighbor. The increase in the positivity rate may also be due to the fact that the teenage population is more mobile compared to other age groups and is also more commonly seen in the ER of SPMC.

Upon review of the monthly positivity rate, the highest rates were noted in March 2020 to July 2020. In the early months of the pandemic, testing of cases was highly selective. Initial protocol from the Department of Pediatrics requires testing those with travel history or exposure to a confirmed case only. The increase in the positivity rate during this time may be due to a skew in the data with only individuals at greatest risk of infection within a community being tested.

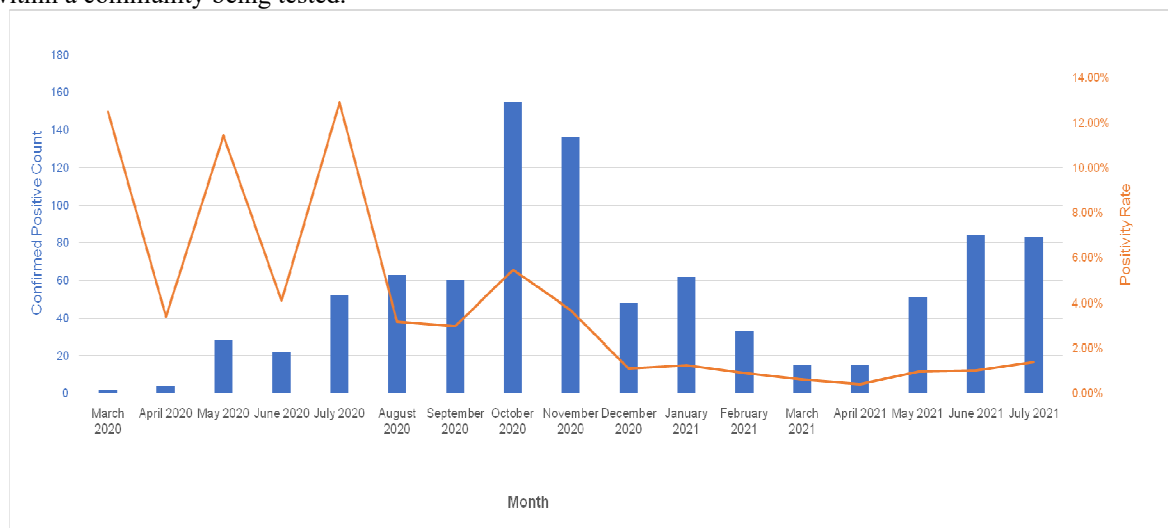


Figure 2 Confirmed positive count VS Positivity rate

For the months of March-July 2020, the graph of the positivity rate is higher compared to the total number of positive cases per month. Upon review of the total tests done per month, it is noted that during these months, the total number of RTPCR done was less than 500 per month, which may account for the higher positivity rate. During these early months of the pandemic, SPMC did not yet have the capability to test for the presence of SARS-CoV-2 through RTPCR and had to send out collected specimens to Manila. A sudden increase in the number of tests per month was noted in August 2020 which was also the time when SPMC Molecular Laboratory had an increased capacity to process RTPCR tests.

During the early months of the pandemic, community quarantines and lockdowns were used as tools to deter the spread of COVID-19 infection. At the end of March 2020, the first COVID-19 infected pediatric case was noted in Davao City. This was the case of a 15-year-old female who was exposed to her confirmed COVID-19 father. She presented with mild symptoms and was admitted to SPMC. At the start of April 2020, local transmission was declared in the city, and the quarantine classification was changed from GCQ to ECQ with stricter lockdowns imposed.²⁸ During this time, the positivity rate decreased by 78.22%.

In May 2020, the quarantine classification of Davao City was changed from a more stringent ECQ to a less strict GCQ.²⁹ This change was accompanied by an increase in the positivity rate by 237.14%. Another spike in the positivity rate was noted in July 2020, with an increase of 214.96% following the shift from GCQ to MGCQ. An initial surge of cases was noted in Davao City by the end of June 2020, which may have affected this increase in positivity rate.³⁰ A further increase in positivity rate in October 2020 (84.32%) was noted, and by November 2020, the quarantine classification of the city was shifted to GCQ from MGCQ which resulted in a 32.69% decrease in positivity rate. In May 2021, another spike in cases was noted while Davao City was on GCQ, prompting a change in quarantine classification to MECQ the following month.³¹

In a separate study, a simulation of different scenarios of community quarantine was conducted, which revealed the importance of quarantines in slowing down the rate of infection and protecting the large fraction of

the susceptible population from being infected. However, this is affected by the willingness and capacity of the subjects or people to fully cooperate.³²

Early testing of patients with COVID-like symptoms is another way to deter the spread of the disease. RTPCR is the first line choice for SARS-CoV-2 detection and is regarded as the “gold standard” test. It is however evident that timing of specimen and period of disease has a role in the accuracy of the test.³³ The study showed that the highest positivity rate of 76.16% was observed in pediatric patients who were tested within 0-5 days from symptom onset, while the lowest positivity rate of 8.65% was noted in those who were tested more than 10 days after the onset of symptoms.

4. Conclusion

Southern Philippines Medical Center, Department of Pediatrics had a positivity rate of 1.79% from March 2020 to July 2021. Out of the total of 913 patients with positive RTPCR results for SARSCov-2, most were between the ages 12-18 years old with the majority being males and having a known exposure to a confirmed COVID-19 individual. Predominantly, patients are asymptomatic or had mild symptoms, with only a small percentage presenting as severe or critical. Children between the ages of 12–18-year-olds had the highest positivity rate, while those under 2-5 years old had the lowest. The positivity rate was affected by quarantine classifications and restrictions with an increase noted after easing of restrictions. Early detection of COVID-19 cases through education of the public about testing of symptomatic cases using RTPCR in communities can help hinder the spread of the disease. Nationwide vaccination of pediatric age groups should be strengthened as they are vulnerable to the disease, albeit with milder symptoms.

Declaration of conflict of interest

The authors declare no conflicts of interest regarding this manuscript.

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