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# Laboratory diagnosis of COVID-19 cases from nasal and oropharyngeal swab specimens

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## ABSTRACT

**Introduction:** Indonesia first reported Covid-19 on March 2, 2020, which continued to increase and spread rapidly throughout Indonesia. WHO recommends molecular examinations for patients with suspected COVID-19 through molecular detection method or NAAT (Nucleic Acid Amplification Test), including Real Time-Polymerase Chain Reaction (RT-PCR) tests. This study aimed to describe the profile of RT-PCR test services on nasal and oropharyngeal swab specimens from patients treated at Dr. Pirngadi Hospital Medan and patients of primary health care (Puskesmas) or other hospitals referred for RT-PCR examination at the Laboratory of Dr. Pirngadi Hospital.

**Method:** This was a retrospective, descriptive study using secondary data from medical records from August 2020 to July 2021. Using consecutive sampling, the study sample was all suspected and confirmed COVID-19 specimens collected at Dr. Pirngadi Hospital, Medan. All collected data were processed and analyzed using IBM SPSS version 20.0.

**Result:** There were 7495 specimens of COVID-19 from Dr. Pirngadi Hospital from August 2020 to July 2021, of which 1264 (17%) were confirmed positive, and 6231 (83%) had negative results. Meanwhile, 12.274 specimens were obtained from primary health care or other hospitals, of which 2602 (2%) samples were confirmed positive, and 9672 (98%) had negative results. Based on sex, 884 men (44%) and 1108 women (56%) had confirmed COVID-19 cases.

**Conclusion:** From August 2020 to July 2021, this study found 17% and 2% of confirmed COVID-19 cases at Dr. Pirngadi Hospital and primary health care or other hospitals, respectively. COVID-19-confirmed issues were more common in women.

**Keywords:** COVID-19, nasal and oropharyngeal swab specimens, laboratory diagnosis.

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## INTRODUCTION

World Health Organization (WHO) declared the COVID-19 pandemic on March 11, 2020. COVID-19 cases have kept increasing and spreading rapidly throughout Indonesia ever since.<sup>1</sup> Therefore, as an early response to the COVID-19 outbreak, Health Minister has made a decree (Keputusan Menteri Kesehatan [KMK]) No. HK.01.07/MENKES/104/2020 on Stipulation of Novel Coronavirus infection (2019-nCoV infection) as a type of disease that can cause outbreaks and efforts to overcome them.<sup>2</sup>

The most common clinical manifestations of COVID-19 are fever, fatigue, and dry cough. Some patients might suffer from aches and pains, nasal congestion, runny nose, headache, conjunctivitis, sore throat, diarrhea, loss of smell (anosmia), or skin rash. In severe cases, patients could develop Acute Respiratory Distress Syndrome (ARDS),

sepsis and septic shock, and multi-organ failure, including kidney or acute heart failure leading to death.<sup>3,4</sup>

COVID-19 was classified as suspect, probable, and confirmed cases (positive RT-PCR test result). NAAT SARS CoV-2 test is a nucleic acid-based test to detect and identify the genetic material of SARS CoV-2 RNA. The sensitivity of each NAAT method can differ in detecting genetic material in specimens. WHO recommends molecular examination for patients with suspected COVID-19 through molecular detection method/NAAT (Nucleic Acid Amplification Test), including Real-Time Polymerase Chain Reaction (RT-PCR) test using upper (nasal and oropharyngeal swab) or lower respiratory specimens (sputum/induced sputum, bronchoalveolar lavage, and tracheal aspirates).<sup>5,6</sup>

Currently, the RT-PCR examination remains the gold standard for diagnosing COVID-19 with the sampling and

examination protocol set by WHO standards. One of the main specimen types in RT-PCR examination is oropharyngeal and nasal swabs.<sup>7</sup> Oropharyngeal specimens are generally used because they represent viral load well, thereby providing sensitivity and reliability of results. However, nasal specimens are also used as an alternative because oropharyngeal sampling must be performed by professionals, which is generally invasive and cause discomfort to the patient.<sup>8</sup> Therefore, data regarding the diagnosis of COVID-19 based on laboratory findings is needed to support appropriate and efficient disease management.

This study aimed to describe the profile of RT-PCR services at Dr. Pirngadi, Medan, from August 2020 to July 2021.

## METHODS

### Study design

This was a retrospective, descriptive study using secondary data of suspected and

**Table 1.** Profile of RT-PCR test at Dr. Pirngadi Hospital, Medan, from August 2020 to July 2021.

Month/ Year	Dr. Pirngadi Medan specimens			Primary Health Care/other hospitals specimens		
	Positive	Negative	Total	Positive	Negative	Total
August 2020	55	45	100	152	189	341
September 2020	61	245	306	341	1.449	1.790
October 2020	26	293	319	173	1.768	1.941
November 2020	7	597	604	45	1.259	1.304
December 2020	34	538	572	107	1.009	1.116
January 2021	167	1.034	1.034	166	993	1.159
Februari 2021	133	871	1.004	74	501	575
March 2021	74	501	575	209	1.375	1584
April 2021	151	705	856	380	1.477	1857
May 2021	151	352	503	278	1012	1290
June 2021	108	358	466	287	1472	1759
July 2021	297	692	989	891	1630	2521

**Table 2.** Profile of RT-PCR test based on sex from August 2020 to February 2021 at Dr. Pirngadi Hospital, Medan.

Sex	Men		Women	
	Positive	Negative	Positive	Negative
	884	5632	1108	6975
Total	14599		8083	

confirmed COVID-19 cases from medical records from August 2020 to July 2021 at Dr. Pirngadi Hospital, Medan. RT-PCR specimens were obtained from patients at Dr. Pirngadi Hospital Medan and patients referred to Dr. Pirngadi Hospital from primary health care or other hospitals. The type of specimens used for the RT-PCR test was nasal and oropharyngeal swabs. RT-PCR results were divided into 2 groups, namely negative and positive COVID-19 patients.

### Study population

The study population was all suspected and confirmed COVID-19 specimens collected at Dr. Pirngadi Hospital, Medan. The study sample was selected using the consecutive sampling method. The inclusion criteria were all cases with oropharyngeal or nasal swab specimens that RT-PCR could test. Exclusion criteria were all specimens that had previously undergone RT-PCR tests.

### Data analysis

All collected data were processed and analyzed using IBM SPSS version 20.0. The descriptive analysis was conducted to describe the frequency distribution of baseline characteristics (gender) and the RT-PCR test profile of the patient. In addition, the RT-PCR test profile based

on specimen source and gender is also described.

## RESULTS

There were 7495 specimens of COVID-19 collected from Dr. Pirngadi Hospital from August 2020 to July 2021, of which 1264 (17%) were confirmed positive, and 6231 (83%) were negative. Meanwhile, 12.274 specimens were obtained from primary health care or other hospitals, of which 2602 (2%) samples were confirmed positive, and 9672 (98%) were negative, as shown in Table 1.

Table 2 shows 1992 patients with confirmed COVID-19 from August 2020 to February 2021, consisting of 884 men (44%) and 1108 women (56%).

## DISCUSSION

Until now, this retrospective study was the first to provide a profile description of suspected and confirmed COVID-19 specimens tested in Dr. Pirngadi Hospital Laboratory, Medan. Several previous studies have reported that some patients can be diagnosed with COVID-19 without showing clear symptoms or clinical manifestations. Moreover, several patients were also diagnosed with COVID-19 regardless of the negative results of the clinical diagnosis. In addition,

several clinical images of COVID-19, including shortness of breath, chest x-ray findings, and lymphopenia, can also be found in patients with negative swab results.<sup>9,10</sup> These findings indicate that some laboratory diagnosis, such as RT-PCR test, is needed as the basis for adequate management of COVID-19 patients. Other studies have also shown that RT-PCR examination in individuals with a history of COVID-19 can better reflect the patient's basic characteristics and laboratory findings. Furthermore, diagnostic tests involving hematological parameters, such as blood gas analysis and inflammatory biomarkers, can also support the test results.<sup>11,12</sup>

RT-PCR examination is generally used because of its high sensitivity. Previous studies showed that RT-PCR examination using oropharyngeal and nasal specimens had a sensitivity of up to 94.2% and 88.9%, respectively, with a specificity of up to 100%.<sup>8</sup> One of the important points in the RT-PCR examination that must be considered is the swab specimen which must be taken within the first few days from the onset of symptoms because it is related to the expression of viral RNA that can be detected, which increases maximally within 7 to 10 days after the first symptoms. Therefore, RT-PCR tests generally experience a decrease in sensitivity and delay in examining the patient.<sup>13</sup>

This study found more positive COVID-19 diagnoses in the female group. This finding is not parallel with previous studies, such as a study conducted at Abdul Wahad Sjahranie General Hospital

Samarinda from March to April 2021 demonstrated that among 442 patients with confirmed COVID-19, 269 were men (60.9%) and 248 were women (56.1%). Laboratory research of Jakarta Haji Hospital from September 1, 2020, to October 6, 2020, also found 30 samples with positive RT-PCR results, composed of 17 men (56.7%) and 13 women (43.3%).<sup>14</sup> Among 99 patients at Immanuel Hospital in Bandung from March to October 2020, 48 were confirmed positive, and 51 were negative. More women suffered from COVID-19 (54.2%).<sup>15</sup> The predominance of female patients diagnosed with COVID-19 in this study may be related to the nature and perception of women in responding to the COVID-19 pandemic. This causes women to be more alert and responsive to disease manifestations than men, thus causing the RT-PCR examination to be earlier in the group of women than men.<sup>16</sup> On the other hand, the prevalence of male patients who are confirmed to have COVID via RT-PCR can be caused by some factors, some of which are differences in immune response, ACE2 levels (along with the findings of the ACE2 gene on chromosome X), and the effect of testosterone on ACE2 levels compared to women.<sup>17</sup>

The limitations of this study include the location for examining specimens which are only limited to Dr. Pirngadi Hospital Laboratory, Medan, so a multicenter study is needed to involve more hospitals in Medan, which will provide more representative data. In addition, the results of other examinations, such as blood tests, were not reported in this study.

## CONCLUSION

From August 2020 to July 2021, 17% and 2% of specimens with suspected COVID-19 cases at Dr. Pirngadi Hospital, Medan, and primary health care or other hospitals were confirmed cases based on RT-PCR results, respectively. In addition, this study suggested that COVID-19 was more common in women.

## DISCLOSURES

### Author Contribution

The author contributes to all processes involved in this study.

### Conflict of Interest

No potential conflict of interest relevant to this article was reported.

### Ethical Approval

This study was approved and given ethical acceptance by the institution.

### Consent for Publication

The patient informed consent was obtained directly. Written permission to participate in the study and presentation of data obtained from patients who had agreed to participate in this study were collected and received.

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