

# Dr. Soetomo General Hospital Covid-19 Scoring System: Accuracy in Detecting RT-PCR Positive Covid-19 Case in Emergency Surgical Patients

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## Abstract:-

**Introduction:** COVID-19 scoring system is an initial screening tool in assessing COVID-19 infection risk quickly. It is especially used in emergency surgical cases that need immediate treatment. The parameters used in this tool are epidemiologic condition, clinical symptoms, and other tests results. This study aims to analyze the accuracy of Dr. Soetomo General Hospital COVID-19 scoring system in assessing COVID-19 infection risk compared to RT-PCR COVID-19 nasopharyngeal swab test as the gold standard in diagnosing COVID-19 infection.

**Methods:** Data of 525 emergency surgical patients during October to December 2020 were obtained from medical records. Quick assessment was performed using Dr. Soetomoo General Hospital COVID-19 scoring system and diagnosis was done by RT-PCR COVID-19 nasopharyngeal swab test. Statistical analysis used was the Chi-square test, p value <0.05 indicated significant correlation.

**Results:** Category of COVID-19 infection risk were divided to three levels, low risk, intermediate risk, and high. RT-PCR COVID-19 nasopharyngeal swab was positive in 1.42% of low risk patients, 1.45% of intermediate patients, and 79.54% of high risk patients. Chi-square analysis showed significant correlation in intermediate to high risk patients with p value of <0.000. AUC was 0.922 (95% CI 0.863–0.981).

**Conclusions:** Intermediate to high risk category had good accuracy, sensitivity, and specificity in detecting COVID-19 infection. There were positive cases in low to intermediate risk category, a standard Personal Protective Equipment (PPE) was important in all category of scoring risk.

**Keywords:-** COVID-19 Scoring System, Quick Assessment, RT-PCR COVID-19 Nasopharyngeal Swab, Emergency Surgical Patients.

## I. INTRODUCTION

World Health Organization (WHO) announced COVID-19 as a pandemic at March 11<sup>th</sup> 2020. It has been more than a year but this pandemic is still a concern in countries all around the world (Park et al., 2020). COVID-19 is a RNA virus, 120-160 nanometers in particle size and has similarities to Severe Acute Respiratory Illness Coronavirus (SARS-CoV) that became an outbreak back in 2002-2004. Both COVID-19 and SARS-CoV belong to subgenus Sarbecovirus of Coronavirus hence International Committee on Taxonomy of Viruses names this virus as SARS-CoV2 (Riedel et al., 2019) (of the International, 2020).

SARS-Cov2 infects cells by binding to angiotensin converting-enzyme 2 (ACE2) receptors. Human to human transmission is by droplets that come out of the respiratory tract when talking, coughing, or sneezing (Xie et al., 2020) (Zhang et al., 2020). A study claims that SARS-Cov2 remains viable in aerosol form for around 3 hours, on copper for 4 hours, on a cardboard box for 24 hours, on plastic and stainless steel for more than 72 hours (Doremalen et al., n.d.) (De Wit et al., 2016).

Clinical manifestation of COVID-19 is a broad spectrum from asymptomatic, mild symptom such as fever, cough, fatigue, malaise, anorexia, myalgia to severe symptom such as dyspnea, pneumonia, Acute Respiratory Distress Syndrome (ARDS), and septic condition. In some cases there were nonspecific symptoms like sore throat, nasal obstruction, headache, diarrhea, nausea, vomiting, and loss of smell or taste. Those symptoms usually appeared before respiratory symptoms. Mild to moderate infection took up to 80% of case, severe infection took 13.8% of cases, and critical condition found in 6.1% of cases. Proportion of asymptomatic cases is still not known however reports of viremia and high viral load were found in asymptomatic patients (Kampf et al., 2020).

RT-PCR with nasopharyngeal swab specimen remains the gold standard examination in detecting COVID-19 infection however often it took too long to get the result when infection detection rate was high especially in Indonesia. WHO released a scoring system for detecting a possible COVID-19 infection quickly so that further examination and

treatment can be done immediately while waiting for the RT-PCR result (Susilo et al., 2020).

Emergency surgical cases need immediate response in diagnosis and treatment. A good scoring system is important in this case as it could save a lot of time. Dr. Soetomo General Hospital developed a local scoring system to identify and separate a possible COVID-19 patient from a non-COVID-19 one. COVID-19 patient need different operating theatre and Personal Protective Equipment (PPE). This study aims to analyze the accuracy of Dr. Soetomo General Hospital COVID-19 scoring system in detecting RT-PCR positive COVID-19 patients.

**II. METHODS**

Data were obtained from medical records. Emergency surgical patients in Dr. Soetomo General Hospital Emergency Room during October to December 2020 who were getting RT-PCR nasopharyngeal swab test for COVID-19 and scored with of Dr. Soetomo General Hospital COVID-19 scoring system were taken as samples. Patients referred from other hospital who were confirmed positive for RT-PCR COVID-19, COVID-19 patients undergoing treatment, and patients with incomplete medical record were excluded. Dependent variable of this study was RT-PCR COVID-19 nasopharyngeal swab test whereas independent variable was Dr. Soetomo General Hospital COVID-19 scoring system. Chi-square test was chosen for statistical analysis using SPSS 25 software.

MAJOR	SCORE	NOTE
1. S/O: History of contact with RT-PCR confirmed COVID-19 patients without standard PPE PLUS ≥1 minor objective criteria.	≥1 finding(s) in major criteria = 20	Quick assessment is performed with information from quick history taking, physical examination, and objective data from other tests available. Dr. Soetomo General Hospital COVID-19 scoring system category Low risk: 1—4 Intermediate risk: 5—19 High risk: ≥20 Category of infection risk can change as further test carried out. The aim of this quick assessment tool is to improve safety for medical personnel. *further radiologic and laboratory tests are needed S = subjective O = objective
2. O: Bilateral basal infiltration of lungs in chest x-ray.		
3. O: Bilateral ground glass opacity in chest CT scan.		
MINOR	SCORE	
1. S: Working/attending public event/going to place of worship/market/other public spaces.	≥1 finding(s) in minor criteria number 1—4 = 20	
2. S: Living in or going to places with infected people.		
3. S: Person living in the same house working or going to places with positive case/high risk.		
4. S: Surrounding environment had RT-PCR confirmed COVID-19 case.		
5. S/O: Fever/history of fever in the last 14 days (body temperature >37.5°C).	≥1 finding(s) in minor criteria number 5—8 = 20	
6. S/O: Anosmia.		
7. S/O: GI tract symptoms (diarrhea/nausea/vomiting/stomachache).		
8. S/O: Respiratory tract symptoms (cough/rhinorrhea/dyspnea)*.	1	
9. O: Comorbidity (diabetes mellitus/hypertension/chronic kidney disease/malignancy/autoimmune/cardiac abnormality/obesity/pregnancy).		
10. O: Leucopenia (<5000/cmm).		
11. O: Neutrophil Lymphocyte Ratio (NLR) >3.5.		
12. O: Absolute Lymphocyte Count <1100.		
13. O: Low platelet count (<180000).		
14. O: CRP >5 times normal value.		
15. O: Bilateral peripheral basal infiltration in chest x-ray.		
16. O: Bilateral diffuse infiltration in chest x-ray.		
17. O: Unilateral infiltration in chest x-ray.		
18. O: Bilateral central infiltration in chest x-ray.		
19. S: History of contact with COVID-19 patients without standard PPE WITHOUT other findings.	10	

Table 1. Dr. Soetomo General Hospital COVID-19 scoring system

**III. RESULTS**

Data were obtained from 525 patients, 45.9% of them were male and 54.1% were female. Median age was 34.46 years old. RT-PCR COVID-19 nasopharyngeal swab was positive in 42 patients, 86% of them were confirmed

positive from the first swab and 14% were from the second swab. Result of scoring was 70 patients scored as low risk, 411 patients scored as intermediate risk, and 44 patients

scored as high risk. RT-PCR COVID-19 nasopharyngeal swab was positive in 1.42% of lowrisk patients, 1.45% of intermediate patients, and 79.54% of highrisk patients.

Statistical analysis with Chi-square test showed that correlation between low to intermediate risk and positive RT-PCR COVID-19 was not significant (p value = 0.984). Sensitivity and specificity were 85.7% and 14.6% respectively. Negative Predictive Value (NPV) and Positive Predictive Value (PPV) were 98.5% and 1.45% respectively.

On the other hand correlation between intermediate to high risk and positive RT-PCR COVID-19 was found significant with p value.

<0.000. Sensitivity and specificity were 85.4% and 97.8% respectively. Negative Predictive Value (NPV) and

Positive Predictive Value (PPV) were 98.5% and 79.5% respectively. Analysis using Receiver Operating Characteristic (ROC) curve showed Area Under Curve (AUC) of 0.922 (95% CI 0.863—0.981, p value 0.000).

Table 2. Characteristics of Dr. Soetomo General Hospital COVID-19 scoring system and RT-PCR COVID-19 nasopharyngeal swab results.

Category	RT-PCR COVID-19 nasopharyngeal swab results		Total
	Negative	Positive	
Low risk	69	1	70 (13.3%)
Intermediate risk	405	6	411 (78.3%)
High risk	9	35	44 (8.4%)
<b>Total</b>	483	42	525 (100%)

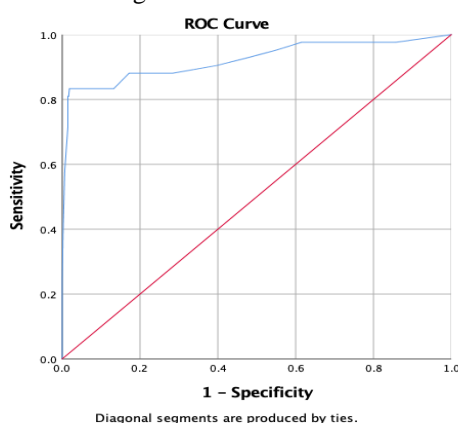
Table 3. Percentage of RT-PCR COVID-19 nasopharyngeal swab positive patients in each category of Dr. Soetomo General Hospital COVID-19 scoring system

Category	Percentage of RT-PCR COVID-19 nasopharyngeal swab positive
Low risk	1/70 (1.42%)
Intermediate risk	6/411 (1.45%)
High risk	35/44 (79.54%)

Table 4. Statistical analysis of correlation between Dr. Soetomo General Hospital COVID-19 scoring system and RT-PCR COVID-19 nasopharyngeal swab

Category	P value	Sensitivity	Specificity	Negative Predictive Value (NPV)	Positive Predictive Value (PPV)
Low to intermediate risk	0.984	85.7%	14.6%	98.5%	1.45%
Intermediate to high risk	0.000	85.4%	97.8%	98.5%	79.5%

Figure 1. ROC Curve



#### IV. DISCUSSION

RT-PCR COVID-19 nasopharyngeal swab remains the gold standard in diagnosing a COVID-19 infection however it took several hours to get the result. Emergency surgical patients could not afford to wait that long before undergoing further examination and treatment as time were very valuable for them. In this case a quickly done but accurate scoring tool was needed thus Dr. Soetomo General Hospital released a scoring system in order to assist in doing quick assessment of determining COVID-19 infection risk. Parameters used in

this scoring system included contact with RT-PCR COVID-19 positive patients without standard PPE, history of going to highrisk places, sign and symptoms, physical examination, laboratory tests, and radiologic tests. Some laboratory or radiologic tests such as CRP or thorax CT were not performed in all patients initially.

Statistical analysis using Chi-square to determine correlation between low to intermediate risk category with positive RT-PCR COVID-19 nasopharyngeal swab test was not significant (p value = 0.984). Descriptive data showed

positive RT-PCR COVID-19 test results were higher in intermediate risk category compared to lowrisk category. Significant correlation was found in intermediate to highrisk category with p value of 0.000 which meant higher score indicated higher the risk of COVID-19 infection.

Sensitivity of intermediate to highrisk category in detecting COVID-19 infection was 85.4% thus within all patients who scored as intermediate to high risk, 85.4% were tested positive using RT-PCR COVID-19 nasopharyngeal swab. Specificity of 97.8% meant in patients who were not categorized as intermediate to high risk, 97.8% of them were tested negative using RT-PCR test. AUC of 0.922 (95% CI 0.863—0.981, p value 0.000) showed that this scoring system was an excellent classifier.

RT-PCR COVID-19 nasopharyngeal swab tests were found positive in 1.42% of lowrisk patients and 1.45% of intermediate risk patients. This result meant that a standard PPE was necessary no matter what the scoring category was as medical personnel still had 1.42—1.45% chance of getting COVID-19 from those patients.

Similar study was carried out in Brazil by Vieceli et al. (2020) using history of contact with RT-PCR COVID-19 positive patients, history of travels, lower leucocyte count, higher LDH level, elevation of ALT and AST, CRP level, and D-dimer level, and thorax CT as parameters (Vieceli et al., 2020). Sensitivity and specificity of scoring system in this study were 96% and 73.5% respectively with AUC of 0.827 (95% CI 0.75—0.90). Parameters found significant were lower leucocyte count, higher LDH level, and radiologic findings (Liu et al., 2020).

Song et al. (2020) used COVID-19 early warning score (COVID-19 EWS) as a screening tool to identify highly suspected patients. This tool was statistically accurate with AUC training dataset 0.956 (95% CI 0.934—0.978, p value <0.001) and AUC validate dataset 0.966 (95% CI 0.929—1, p value <0.001). Parameters of COVID-19 EWS were signs of pneumonia on thorax CT, history of close contact with COVID-19 patients, fever, age  $\geq 44$  years old, male, maximum body temperature  $\geq 37.8^\circ\text{C}$ , respiratory symptoms, and NLR  $\geq 5.8$ .

Limitations of this study was not all parameters could be assessed causing bias in this scoring system. Further research using prospective design and samples who have all the parameters needed may lower the data bias.

## V. CONCLUSIONS

There was significant correlation between intermediate to highrisk category and positive RT-PCR COVID-19 nasopharyngeal swab. Higher score indicated higher risk of positive RT-PCR test. Dr. Soetomo General Hospital COVID-19 scoring system had good accuracy in detecting COVID-19 infection and could be used as a standard initial assessment tool to categorize emergency surgical patients while waiting for the RT-PCR test result. Standard PPE remained necessary in all scoring category.

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