

Conversion Time of Covid-19 RT-PCR Test Among Health Workers

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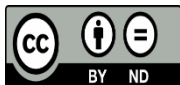


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Covid-19, Conversion Time, RT-PCR, Healthcare Worker

ABSTRACT

One of key sector to combat covid-19 is healthcare, whose worker are put in high risk affected physical, mental and social. Healthcare worker (HCW) defined as all staff involved to provide treatment for covid-19 patients and are put in higher risk to SARS-CoV-2 exposure than general population. In addition, infected HCW are required to work immediately as the amount of HCW is limited. Indonesia applied entry and exit test in five days to shorten isolation and quarantine period. The policy has also been applied to HCW in Sulianti Saroso Infectious Disease Hospital since January 2022. This study accounted 229 covid-19 confirmed healthcare worker in Sulianti Saroso Infectious Disease Hospital with admission date January 1st – February 28th, 2022. Conversion time was divided into two categories, less than equal to 10 days and more than 10 days. Our study showed out of all, only 20,5% of our healthcare workers had conversion ≤ 10 days. It means most of the result of exit test RT-PCR on day 5 after confirmed date was positive. We found correlation between symptoms and conversion time ($p = 0,0001$). We also found significant correlation between severity and conversion time ($p = 0,0001$) as in line to preceding studies. this study aimed to give recommendation and evaluation on exit test on day 5 for healthcare worker policy.



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1. Introduction

In the end of 2019, the world face global pandemic called COVID-19 which was caused by *Coronavirus* family, SARS-CoV-2. It was first detected in Wuhan City in China and sporadically spread around the globe [1], [2]. In Indonesia, Covid-19 case was first publicly announced in March 1, 2020 by the Health Minister. Until July 2022, 6.143.431 confirmed case reported and there were 156.865 mortality cases [3].

RT-PCR (Reverse Transcription Polymerase Chain Reaction) was used to make diagnosis of the disease. PCR was aimed to detect RNA (Ribonucleic Acid) of SARS-CoV-2. PCR conversion time was defined as period from the first onset of symptom to the day negative PCR detected. Negative conversion was

correlated to clinical manifestation and pathology of the disease thus it was used as [4- 6]. At first, conversion time was used as reference to finish isolation and quarantine, yet in May 2020, World Health Organization revised their recommendation. Isolation was finished without relying to RT-PCR results for asymptomatic patient and those who had clinical symptoms resolution for symptomatic stage patient [7]. In this matter, re-examination of RT-PCR was unnecessary.

Because of this global disaster, health sector was deeply affected. Healthcare Workers (HCW), mainly front-liner, were exposed in greater hazard. They faced physical, psychological and social risks. HCW was in higher risk than general population to get infected. In this matter, healthcare workers included those doctor, nurse, laundry worker, technician, phlebotomist, physiotherapist, and health social workers [8], [9]. In the beginning of the pandemic, more than 10% reported case in China and Italy was healthcare workers. In Spain, 20,4% confirmed case was HCW's [10- 12]. In United States, up to June 2021, there were 509.214 confirmed case among HCW with 1652 mortality case. In Indonesia, 504 HCWs were passed away because of Covid-19 in 2020, including 252 doctors, 171 nurses, 64 midwives, 7 pharmacist and 10 laboratory technicians [13], [14].

HCWs role in battle the pandemic was extremely essential, mainly in peak wave season of the disease. Even if they got infected, they were demanded to be back to 'battlefield' as soon as possible as limited resources in hospital [15] In interim guideline of WHO in February 2022, the organization suggested healthcare worker in high risk exposure follow quarantine regulation to avoid exposing patient, colleague, family and their contact to the hazard. Based on the consideration, a shortened period of quarantine was suggested. If a HCW had no symptom and exit test PCR on day 7 after confirmation date was negative, quarantine days would be lessened to 7 days or 10 days without exit test [16].

In current condition, Indonesia applied entry and exit test with 5 days period. This strategy aimed to accelerate isolation and quarantine period. The policy had also been applied to HCWs in Sulianti Saroso Infectious Disease Hospital (SSIDH) since Omicron wave entered Indonesia, January-February 2022 [17].

Survey Point

The aim of this deliberate study was to describe clinical manifestation of Covid-19 among HCWs in SSIDH, RT-PCR conversion time and its related factors. We also hope to submit recommendation and evaluation on exit test on day 5 for healthcare worker policy.

Methods

This study was a cross sectional analytic study on all confirmed Covid-19 case among HCWs of SSIDH in January-February 2022. HCWs included all staff works in hospital both providing care for patients and resources for health works. We used secondary data collected based on hospital epidemiology surveillance.

Conversion time was categorized into two groups, below or equal to 10 days and more than 10 days. It was based on Indonesia's official Covid-19 digital tracking application, Pedulilindungi. If the result of PCR test was positive, the app would change into Black bar and it would be automatically back to Green bar 10 days later after confirmation date without having to redo PCR test.

Inclusion criteria was all HCWs who was Covid-19 positive and complete data of epidemiology surveillance form. We performed univariate and bivariate analysis. The study had been approved by ethical committee of SSIDH via ethical clearance no. 56/XXXVIII.10/VIII/2022.

2. FINDINGS AND DISCUSSION

This study accounted 229 covid-19 confirmed healthcare workers (34,9%) in Sulianti Saroso Infectious Disease Hospital with admission date January 1st – February 28th, 2022. In general, our participants were female (60,9%). Most of participants were 30-39 years old (35,4%), followed by 40-49 years old groups. The participants were mainly functional HCW, such as doctor, nurse, midwives and others (65,1%).

Compared to general population, HCWs were first prioritized population to get vaccination. At that time being, there were 144 participants (62,9%) who had booster vaccination. In line to National Institute of Health Research and Development study that stated vaccine couldn't fully protect from getting infection, but complete vaccination avoided hospital admission, disease progression and mortality cases [18]. Half of participants got reinfection (50,7%). Wang J. mentioned reinfection might occur because of different strains stroked as some of reinfection case progressed to severe cases. In contradiction, other studies found it was possible to reinfected by the different strain of SARS-COV-2, weeks or months after first infection [19- 21].

Participants who experienced symptom(s) were 69,4%. Cough, runny nose and fever were symptoms that were mostly found in our participants, followed by myalgia, cold sweating, and chills. HCWs who complaint having cough also said they experienced hoarseness, dysphonia or even aphonia, and sore throat. A few of them were also experienced anosmia. Majority of them (68,4%) included as mild Covid-19 case, 29,7% of them were asymptomatic case and two cases (0,9%) were moderate cases. As a result, our participants were outpatient and experienced home-isolation. Most of the participant didn't have comorbid disease (83,4%). Comorbid disease was risk factor related to disease progression. In our study, participants who were moderately ill, having comorbid disease and being inpatient resolute fully.

In Interiem Guideline of WHO in February 2022, WHO suggested HCWs who were out in high risk of SARS-CoV-2 transmission should avoid working and followed through quarantine policy in order to detach exposing risks to patients, colleague, family and community. Based on the recommendation, quarantine days became seven days for asymptomatic case and closed contact HCW with negative antigen or PCR or finished at Day 10 without reexamination of RT-PCR. These policy could be modified in case of extreme rising of workload and lack of HCWs. HCWs who continued working after being exposures should follow Infection prevention and control policy strictly, use Personal Protective Equipment (PPE) and autonomous symptoms monitor and get themselves tested if required. HCWs in these circumstances shouldn't provide care for immunosuppression and high risk patient, for instance, elderly and patient with uncontrolled comorbid disease [16].

We found out conversion time and presence of symptom were significantly correlated ($p=0,0001$). Out of all, only 20,5% of our healthcare workers had conversion ≤ 10 days. It means most of the result of exit test RT-PCR on day 5 after confirmed date was positive. Some previous study stated symptoms as prolonged RNA conversion predictor [6], [22]. This was also relevant to study of [22] that concluded symptoms as predictor of prolonged RNA. His study showed average period of conversion time was 24 days (Interquartiles/IQR: 18-36 days) in symptomatic cases versus 20 days (IQR: 16-30 days) in asymptomatic cases. Mild cases would go through viral clearance earlier than moderate or severe cases and viral clearance in symptomatic cases takes longer than asymptomatic cases. This phenomenon might be useful marker to consider prognosis of particular cases. In our study, we also found significant correlation between severity and conversion time ($p=0,0001$) as in line to preceding studies [23], [24]. [6] studied a group of mild-moderate COVID-19 patients. He found that fever, nausea, diarrhea and abnormal thorac CT scan were risk factors to prolonged *Negative Conversion Time* (NCT). ($p<0,05$).

Contradicted to [25], no correlation between conversion time and presence of symptom ($p=0,07$), even though he found 2 days difference between symptomatic [median (SE)] 17 (1,07) vs 19,5 (0,63) days in asymptomatic case. He concluded self isolation was still needed for asymptomatic case in order to avoid transmission.

Other variables such as age, gender, job category, booster vaccination status, reinfection status and comorbid disease wasn't found corresponded to conversion time as described in Table 1.

Table 1. RNA SARS Covid-19 conversion time among HCW

Variable	Conversion Time		P value
	≤10 hari	>10 hari	
Symptom			
Yes	21	138	0,0001
No	26	44	
Severity			
Moderate	0	2	0,0001
Mild	21	138	
Asymptomatic	26	42	
Age			
>60 years old	0	1	0,573
50-59 years old	7	21	
40-49 years old	18	57	
30-39 years old	12	69	
20-29 years old	10	34	
Gender			
Male	20	70	0,609
Female	47	182	
Job category			
Healthcare Worker	12	68	0,170
Supporting Healthcare Worker	35	114	
Booster Vaccination Status			
Yes	27	117	0,401
No	20	65	
Reinfection Status			
First infection	22	91	0,745
Recurrent Reinfection	25	91	
Comorbid disease			
Yes	5	33	0,275
No	42	149	

We found severity was also significantly correlated to conversion time ($Pvalue=0,0001$). Longer conversion time was described in 2 moderate cases (100%), 61,8% asymptomatic cases and 86,8% mild cases. Relevant to [23] research that portray association between severity and negative conversion. He mentioned majority of negative conversion was found in unsevere stage (78,4%, $p=0.001$) with conversion time 17 days. According to Shi (2020), severity stage was one of many factors influenced viral clearance when severe cases took longer time to negative conversion time. By using Acute Physiology and Chronic Health Evaluation II (APACHE II), Shi evaluated severity stage and predict mortality case and found predictive score 0,89 (hazard ratio, HR: 0.89; 95% CI: 84-96) [24].

Result of this study didn't show age and conversion time related ($p=0,693$). This wasn't in line to [26] which stated older patient were more prone to prolonged conversion time. His finding was supported by [27] who concluded older age (>45 years old) was an independent factor related to prolonged negative time (hazard ratio, HR: 0.378; 95% confidence interval, CI: 0.205–0.698). The discrepancy might because of the proportion of our participant who were majorly <40 years old plus lower incidence of comorbid.

As we perform analytical statistic test, no correlation was found between vaccination status and conversion time ($p=0,487$). National Institute of Health Research and Development evaluated incidence and mortality case in vaccinated HCW. They reported 5% of fully vaccinated HCW was confirmed to get infected in period of April-June 2021. Length of stay of vaccinated HCW were mostly shorter (8-10 days) than unvaccinated one (9-12 days). It was noted there were 20 mortality cases and 75% death occurred in unvaccinated and incomplete vaccination [18]. Most of our participants had gotten the third injection (62.9%), moreover some of them has gotten second booster injection. We hypothesized as time went by, there was decreasing protection and effectivity of vaccine.

Constraint

Limitation of the study was absence of measurement time of vaccination to confirmed case. For future study, we suggest this measurement in addition to SARS-COV-2 antibody titer among HCWs. We hope this topic would enlighten us more on effective period to vaccinate, mainly among HCW.

3. Conclusion

Most of infected HCWs in our study were female, 30-39 years old and included as functional HCW (doctor, nurse and midwife). The majority had been vaccinated fully plus booster and didn't have comorbid disease. Large number of participants experienced re-infection and mild symptom. We found presence of symptom(s) and severity were significantly related to conversion time among HCWs.

Entry test and exit test of RT-PCR examination was included in health management in community. Our study showed most of exit test results in day 5 were positive. We suggested evaluation on RT PCR exit test should be evaluated.

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