

# Literature Review: Coronavirus Disease 2019 Re-Infection Case in The World

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## ABSTRACT

The case of Covid-19 re-infection begins to be attentive and has been reported in the whole of the world. Generally, re-infection means someone who gets infection once time and then is better, after that get the infection again. The purpose of this literature review is to identify the case of Covid-19 re-infection based on the individual characters in the world, the symptom of re-infection, and the periods of getting re-infection after asserted healing from the first infection. The research is a literature review and the source data are from several databases are Pubmed, Proquest, and Google scholar from 2020 to 2021. The keyword that used in this literature review is Covid-19 Re-infection. After doing the screening, it is gotten 12 relevant articles and become analysis material in this research. The analysis of this study is to compare the similarities and differences between cases from journals that have been found. The result of this research shows that there are 11 identify individual characteristics, 10 identify that there is a symptom of re-infection, and 9 identify that there are periods of getting re-infection after declared asserted healing from the first infection. It was found that the ages have variation distribution, the gender is dominated by male, and it is co-morbid in the patient who gets Covid-19 re-infection. There are differences in re-infection symptom levels. The periods of getting re-infection after asserted healing from the first infection is more than 90 days. It is still needed further research about Covid-19 re-infection.

**Keywords:** Covid-19 re-infection, review

## 1. INTRODUCTION

Based on worldometer web data as of June 01, 2021, there were 171,384,999 cases of Covid-19 worldwide with a total of 153,896,256 of them recovered, while 3,564,524 died[1]. Reporting from the daily newspaper detikhealth, issued December 06, 2020, the World Health Organization (WHO) said that the number of people infected continues to grow and see reinfection begin to occur. Based on the International Covid-19 reinfection tracker based in the Netherlands, there were 87 cases with 3 deaths and 62 recovered as of May 2021 with an average interval of reinfection after

115 days declared cured[3].

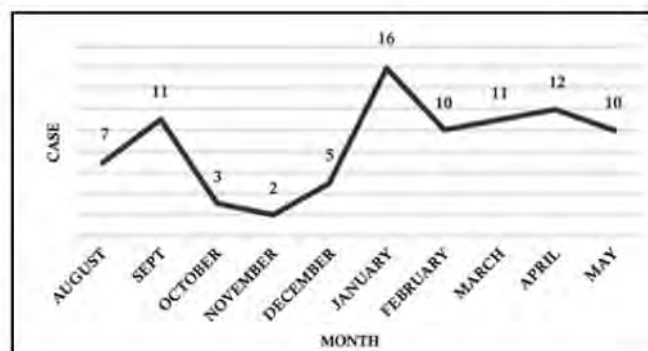


Fig. 1. Global Reinfection Case Trends Reported from August 2020 to May 2021 (Source: BNO News, 2021)

According to The Lancet, eurekaalert.org published March 18, 2021, 0.65% of patients experienced reinfection during denmark's first and second waves. People over the age of 65 are at greater risk of Covid-19 than younger, and protection against reinfection persists for more than six months[4]. In general, reinfection means a person is infected (sick) once, then healed, and then infected again.

In the article Nathionalgeographic.com published December 02, 2020, states that factors that can cause reinfection are the presence of sars-cov-2 virus mutations and low antibody and immune response. In response to reports of reinfection cases, the CDC (2020) recommends the public to keep applying regular hand washing, keep a distance, avoid crowds and always wear masks. Based on the description above, a literature review is needed on "Covid-19 Reinfection Cases in the World".

The goal of the study was to identify the world's Covid-19 reinfection cases based on individual characteristics, reinfection symptoms, and the time span of exposure to reinfection after being declared cured of the first infection.

## 2. RESEARCH METHODS

The method used in this literature review is the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) which is derived from several research results and adapted to the topic of this literature review, then the important findings of the article can be analyzed based on similarities and differences. The source of the article comes from Pubmed, Proquest, and Google scholar. There are screening stages in choosing a journal. Screening 1 choosing paid and unpaid journals, screening 2 reviewing titles and abstracts, screening 3 reviewing background, methods, results and discussion. Data processing reviewed articles related

to Covid-19 reinfection cases in the world based on patient characteristics, symptoms, and time span of reinfection after being declared cured of the first infection. The data analysis was conducted by identifying Covid-19 reinfection cases in the world based on patient characteristics, reinfection symptoms, and the time span of exposure to reinfection after being declared cured of the first infection.

## 3. RESULTS AND DISCUSSIONS

### A. Characteristics of Covid-19 reinfection patients

TABLE 1. CHARACTERISTICS OF COVID-19 REINFECTION PATIENTS

No.	Author, year	Characteristics of the Patient		
		Gender	Age (year)	Comorbid
1.	Hanif et al. (2020)	Male	58	It doesn't have comor-bids
2.	Sharma et al. (2020)	Male	57	Diabetes melitus type 2
3.	Selvaraj et al. (2020)	Male	70	Obesity, chronic low back pain, neuropathy, asthma, obstructive sleep apnea, and hypertension.
4.	Lafaie et al., (2020)	Female	84, 90, and 84	Case 1: Hypertension, beta-lactam allergy, heart failure, atrial fibrillation, type 2 diabetes mellitus, chronic kidney failure, and chronic respiratory failure Case 2: type 2 diabetes mellitus, hypertension, hypothyroidism, Alzheimer's Case 3: Heart disease, pulmonary embolism, hypertension, rheumatoid arthritis, corticosteroid
5.	de Brito et al. (2020)	Male and Female	40 and 44	It doesn't have comor-bids
6.	Inada et al. (2020)	Male	58	Dyslipidemia

7.	Sicsic et al., (2021)	Female	69	Mild intermittent asthma, hypercholelema, hypertension, and sleep apnea (OSA)
8.	West et al. (2021)	Male	25	It doesn't have comorbid
9.	dos Santos et al. (2021).	A total of 26 (78.8%) of patients were female	Average age 39.2 years	A total of 14 (45.5%) patients had a history of comorbid.
10.	Váncsa et al. (2021)	55 of Gender (45,1%) is Female	Average age 49.7 years	The most commonly encountered comorbid were hypertension (26.8%) and diabetes mellitus (23.3%) with a total of 66.3% of patients having 1 comorbid history.
11.	Roberts et al. (2021)	(43.5%) of the 23 female patients	Average age 44.5 years	A total of 17 out of 23 cases did not have comorbid.

There were 11 articles that stated the characteristics of Covid-19 reinfection patients included their gender, age, and comorbid history.

a) Characteristics of reinfection patients based on gender

It found 7 out of 11 journals identified that reinfection patients were male. This can occur due to biological differences in the immune system between men and women. There is a higher content of angiotensin-converting enzyme 2 (ACE2) in the lungs of men than women. This enzyme can help the SARS-CoV-2 virus survive longer[7]. In everyday life, men work outside the home more often than women. This can cause men to be exposed to the virus that causes Covid-19 more often. In addition, male lifestyles such as smoking and a lower tendency to wash their hands than women's can worsen male health conditions[8]. Women have a higher attitude of responsibility towards the Covid-19 pandemic than men so that it can

affect preventive measures such as frequent hand washing, wearing face masks and staying at home.

b) Characteristics of reinfection patients based on age

Based on the results of the study found, reinfection patients have a varying age ranging from 25 years-90 years. According to a Danish study, the elderly (> 65 years old) are classified as more at risk of reinfection because protection from a second infection is only 47%. But in another study stated that reinfection patients are under the age of 65 years. The reason patients with adults (20s and 30s) are widely exposed to the virus that causes Covid-19 is jobs such as in health, food, and essential services that can spread the virus when they return home. Similarly, younger patients can be exposed to the virus that causes Covid-19 while on campus, hang out with others, attend parties, not wear masks, and ignore health protocols. This suggests that the possibility of Covid-19 reinfection may occur in different age groups.

c) Characteristics of reinfection patients based on comorbid

In addition, the presence of comorbid will cause the patient's condition to get weaker. A total of 8 out of 11 journals stated that reinfection patients had comorbid. Comorbid can be associated with moderate or severe levels of Covid-19 reinfection[10]. Patients who have comorbid need attention because the condition is more vulnerable so that when contracting Covid-19 can have a fatal impact. This can be due to damage to internal organs such as the lungs, heart and kidneys that causes the strength and function of the organs to decrease so as to increase the risk of severity in positive patients[11].

## B. Symptoms of Covid-19 reinfection

TABLE 2. SYMPTOMS OF COVID-19 REINFECTION

No.	Author, year	Symptoms of the first Covid-19 infection	Symptoms of reinfection
1.	Hanif et al. (2020)	Fatigue, headaches, and sore throats	Fever (> 39C), headache, muscle pain
2.	Sharma et al. (2020)	Asymptomatic	Fever, myalgia, headache, cough
3.	Selvaraj et al. (2020)	Severe shortness of breath	Severe shortness of breath and fever
4.	Lafaie et al. (2020)	Case 1: Cough, fever, respiratory distress. Case 2: Atrial fibrillation and fever Case 3: Fever, asthenia (weakness), ageusia (loss of sense of taste), dry cough, and polypnea	Case 1: Hypercytemia and respiratory distress Case 2: Severe dehydration with hypernatremia, low oxygen saturation, melena and common conditions Case 3: Decreased breathing, dry cough, and fever.
5.	de Brito et al. (2020)	Case 1: Fever, cough, sore throat, fatigue, myalgia, headache and diarrhea Case 2: Cough, sore throat, fatigue, myalgia, headache, diarrhea	Case 1: Fever, cough, sore throat, fatigue, myalgia, headache and diarrhea, reduced smell and dysgeusia Case 2: Fever, cough, sore throat, anorexia, fatigue, myalgia, reduced smell, dysgeusia, headache, and diarrhea
6.	Inada et al. (2020)	Fever	Asymptomatic
7.	Sicsic et al., (2021)	Shortness of breath, dry cough, fatigue, headache, and fever	fever, and ageia (loss of sense of taste)
8.	West et al. (2021)	Fever, headache, and fatigue	Coryza, fever and fatigue

9.	Sheehan et al., (2021)	-	31 patients experienced reinfection symptoms with the highest symptoms being shortness of breath
10.	Vánicsa et al. (2021)	Fever (70.4%), Cough (62%), Shortness of breath (26.7%), Artomyalgia (18.5%), Headache (12%), Common cold symptoms (17.6%), Weakness (12.8%), Digestive symptoms (18.3)	Fever (30%), Cough (29.9%), Shortness of breath (27%), Artomyalgia (19.2%), Headache (10%), Common cold symptoms (16%), Weakness (8%), Digestive symptoms (9%)

There were 10 articles stating about the symptoms of Covid-19 reinfection. There are 7 articles stating that there are symptoms in the first infection and reinfection of Covid-19, there is 1 article that states that there are no symptoms in the first infection but there are symptoms in the reinfection of Covid-19, and there is 1 article stating that there are symptoms in the first infection but there are no symptoms in the reinfection of Covid-19.

In the symptoms of Covid-19 reinfection, there were several differences found in the study. There are studies that have found no symptoms of Covid-19 reinfection[12]. It was also found that the symptoms in Covid-19 reinfection were milder than the first infection, this was due to the presence of antibodies that had formed from the first infection. In other studies, there was an increase in more severe symptoms. It can be caused by the patient's immune system.

C. Covid-19 reinfection cases in the world based on the time span of the event  
Table 3. COVID-19 reinfection cases in the world based on the time span of the event

No.	Author, year	The time span of getting reinfection after recovering from the first infection
1.	Hanif et al. (2020)	48 day
2.	Sharma et al. (2020)	86 days
3.	Selvaraj et al. (2020)	210 days
4.	de Brito et al. (2020)	44 days and 25 days
5.	Inada et al. (2020)	105 days
6.	Sicsic et al., (2021)	About 70 days
7.	West et al. (2021)	178 days
8.	Sheehan et al. (2021)	About 90 days
9.	Roberts et al. (2021)	About 105 days

There were 9 articles stating the time span of patients exposed to reinfection of Covid-19 after recovering from the first infection. It can be known that the time span of patients affected by reinfection of Covid-19 after recovering from the first infection varies, namely the fastest time span is 25 days while the longest time span is 210 days. Research shows that the release of the virus or immune response can last more than 90 days[13]. This can be because antibodies may not last long after infection.

#### 4. CONCLUSIONS AND SUGGESTIONS

The individual characteristics of Covid-19 reinfection patients by gender are dominated by males, based on age have a varied age distribution, and there are comorbidities in Covid-19 reinfection patients that may affect reinfection events. In the reinfection of Covid-19 there is a difference in the level of symptoms in patients because it is influenced by the individual's immune system and the development of viral muta-

tions. The time span of reinfection may occur after more than 90 days declared cured of the first infection. For health workers are expected to play an active role to provide education about Covid-19 reinfection and prevention so that Covid-19 reinfection can be overcome. For the public is expected to adhere to health protocols and increase the body's immunity because people who have recovered from Covid-19 can still experience reinfection. For further research is expected to further explore the case of Covid-19 reinfection from variables other than those discussed in this literature review.

#### REFERENCE

1. Worldometer, "COVID-19 CORONAVIRUS PANDEMIC," [Internet]. 2021. Available from: <https://www.worldometers.info/coronavirus/>
2. Alam SO, "WHO Sebut Ada Ancaman Reinfeksi COVID-19 (WHO Sebut Ada Ancaman Reinfeksi COVID-19)," [Internet]. 2020. Available from: <https://health.detik.com/berita-detikhealth/d-5283285/who-sebut-ada-ancaman-reinfeksi-covid-19>
3. BNO News, "COVID-19 reinfection tracker," [Internet]. 2021. Available from: <https://bnonews.com/index.php/2020/08/covid-19-reinfection-tracker/>
4. The Lancet, "The Lancet: Study finds COVID-19 reinfections are rare, more common for those above age 65," | EurekAlert! Science News. Lancet [Internet]. 2021. Available from: [https://www.eurekalert.org/pub\\_releases/2021-03/l-tls031821.php](https://www.eurekalert.org/pub_releases/2021-03/l-tls031821.php)
5. CDC, "Reinfection with COVID-19," [Internet]. 2020. Available from: <https://www.cdc.gov/coronavirus/2019-ncov/your-health/reinfection.html>
6. Richards sarah elizabeth, Akpan N, "Already had the coronavirus? You could get

- it again," [Internet]. 2020. Available from: <https://www.nationalgeographic.com/science/article/why-coronavirus-reinfections-are-happening>
7. Bwire GM, "Coronavirus: Why Men are More Vulnerable to Covid-19 Than Women?," *SN Compr Clin Med*. 2020. 2(7):874–6.
  8. Efendi A, "Why Are Men More Susceptible to COVID-19 Exposure Than Women? (Mengapa Pria Lebih Rentan Terpapar COVID-19 Daripada Wanita?," [Internet]. 2020. Available from: <https://tirtoid/mengapa-pria-lebih-rentan-terpapar-covid-19-daripada-wanita-fvtU>
  9. Maragakis LL, "Coronavirus and COVID-19: Younger Adults Are at Risk, Too," [Internet]. 2020. Available from: <https://www.hopkinsmedicine.org/health/conditions-and-diseases/coronavirus/coronavirus-and-covid-19-younger-adults-are-at-risk-too>
  10. dos Santos L, Filho PG de G, Silva AMF, Santos JVG, Santos DS, Aquino MM, et al, "Recurrent COVID-19 including evidence of reinfection and enhanced severity in thirty Brazilian healthcare workers," *J Infect*. 2021. 82(3):399–406.
  11. Kancana KS, "Covid-19 Disease to Watch Out for (Penyakit Penyerta Covid-19 Perlu Diwaspadai)," [Internet]. 2020. Available from: <https://primayahospital.com/covid-19/penyakit-penyerta-covid-19/>
  12. Inada M, Ishikane M, Terada M, Matsunaga A, Maeda K, "Asymptomatic COVID-19 re-infection in a Japanese male by elevated half-maximal inhibitory concentration (IC50) of neutralizing antibodies," 2020. 1063-1067.
  13. Sheehan MM, Reddy AJ, Rothberg MB, "Reinfection Rates Among Patients Who Previously Tested Positive for Coronavirus Disease 2019: A Retrospective Cohort Study," 2021.