

# Autopsy Studies of COVID-19 Illness Rule Out Extensive Myocarditis

Systematic Review of 50 Studies with 548 Hearts Does not Find Heart Inflammation as Significant Contributor to Death



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From the original Baric study demonstrating beta-coronavirus loading in laboratory models can cause myocarditis to the first year of the COVID-19 crisis there has been a concern that SARS-CoV-2 infection in humans could cause heart inflammation. Epidemiologic studies relying on ICD codes triggered by routine cardiac troponin testing and or results implied that hospitalized patients were developing myocarditis with the respiratory illness. None of these studies were confirmed with clinical adjudication or autopsy. In 2020 the NCAA Big Ten athletic conference, US Military, and many other organizations screened for myocarditis on clinical grounds—handful of cases were found without any reported hospitalizations or deaths. Tuvali, et al from Israel, demonstrated that myocarditis in 2020 was not any more common than the low levels of baseline myocarditis from parvovirus, giant cell, and other conditions.

Almamlouk et al performed a systematic review of 50 autopsy studies and 548 hearts of patients who died of or with COVID-19. Usual post-mortem findings of tissue edema and necrosis were reported commonly. About two thirds of hearts had SARS-CoV-2 found in the tissue. However, none of the hearts had extensive myocarditis as the cause of death.



## Systematic review

## COVID-19–Associated cardiac pathology at the postmortem evaluation: a collaborative systematic review

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## ABSTRACT

**Background:** Many postmortem studies address the cardiovascular effects of COVID-19 and provide valuable information, but are limited by their small sample size.

**Objectives:** The aim of this systematic review is to better understand the various aspects of the cardiovascular complications of COVID-19 by pooling data from a large number of autopsy studies.

**Data sources:** We searched the online databases Ovid EBM Reviews, Ovid Embase, Ovid Medline, Scopus, and Web of Science for concepts of autopsy or histopathology combined with COVID-19, published between database inception and February 2021. We also searched for unpublished manuscripts using the medRxiv services operated by Cold Spring Harbor Laboratory.

**Study eligibility criteria:** Articles were considered eligible for inclusion if they reported human post-mortem cardiovascular findings among individuals with a confirmed SARS coronavirus type 2 (CoV-2) infection.

**Participants:** Confirmed COVID-19 patients with post-mortem cardiovascular findings.

**Interventions:** None.

**Methods:** Studies were individually assessed for risk of selection, detection, and reporting biases. The median prevalence of different autopsy findings with associated interquartile ranges (IQRs).

**Results:** This review cohort contained 50 studies including 548 hearts. The median age of the deceased was 69 years. The most prevalent acute cardiovascular findings were myocardial necrosis (median: 100.0%; IQR, 20%–100%; number of studies = 9; number of patients = 64) and myocardial oedema (median: 55.5%; IQR, 19.5%–92.5%; number of studies = 4; number of patients = 46). **The median reported prevalence of extensive, focal active, and multifocal myocarditis were all 0.0%.** The most prevalent chronic changes were myocyte hypertrophy (median: 69.0%; IQR, 46.8%–92.1%) and fibrosis (median: 35.0%; IQR, 35.0%–90.5%). SARS-CoV-2 was detected in the myocardium with median prevalence of 60.8% (IQR 40.4–95.6%).

**Conclusions:** Our systematic review confirmed the high prevalence of acute and chronic cardiac pathologies in COVID-19 and SARS-CoV-2 cardiac tropism, as well as the low prevalence of myocarditis in COVID-19. Raghd Almamoulk, *Clin Microbiol Infect* 2022;28:1066

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**Table 1**  
Summary of median prevalence of cardiac autopsy findings of studies with ≥5 patients

Autopsy finding	Pathology classification	Number of studies	Total number of patients	Median, %	Quarter 1, %	Quarter 3, %
Viral presence	Virology	10	116	60.8	40.4	95.6
Extensive myocarditis	Myocarditis	10	175	0.0	0.0	0.0
Focal active myocarditis	Myocarditis	13	235	0.0	0.0	13.4
Multifocal myocarditis	Myocarditis	9	131	0.0	0.0	2.1
Infiltrates without myocyte injury	Myocarditis	15	279	0.6	0.0	9.8
Pulmonary embolism	Thromboembolic	15	311	22.2	16.7	32.1
Microvessel thrombi	Thromboembolic	8	103	36.2	17.6	61.7
Cardiac large vessel thrombi	Thromboembolic	9	162	14.3	13.3	22.8
Acute myocardial infarction	Thromboembolic	7	104	11.8	7.9	13.8
Small vessel vasculitis	Inflammatory	3	86	28.6	16.0	32.5
Epi-pericarditis	Inflammatory	6	110	15.5	11.9	19.2
Cardiac oedema	Gross pathology	4	46	55.5	19.5	92.5
Myocardial necrosis	Gross pathology	9	64	100.0	20.0	100.0

necrosis	Gross pathology	n	%	100.0	20.0	100.0
Fibrosis	Chronic	13	183	42.9	35.0	90.5
Amyloidosis	Chronic	8	131	13.6	9.8	17.4
Atherosclerotic coronary artery disease	Chronic	14	250	46.2	21.6	80.1
Hypertrophy	Chronic	18	303	69.0	46.8	92.1

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In summary, this review should be the nail in the coffin in ruling out COVID-19 illness as a cause of fatal myocarditis. Despite the virus being found in heart tissue, it was not causing significant inflammation. The explosion of fatal myocarditis by report of unexplained cardiac arrest, adjudication, and at necropsy must have another explanation than SARS-CoV-2 infection. The only new proven cause of heart damage in human populations is COVID-19 vaccination. Vaccines used in America (Pfizer, Moderna, Janssen, Novavax) have been demonstrated to cause myocarditis as published in the peer-reviewed literature.

These observations call for immediate access to the CDC COVID-19 vaccine administration database for physicians and other providers who are managing the burgeoning caseload of myocarditis. This will be the only way the epidemiology of COVID-19 vaccine induced myocarditis can be studied and patient outcomes can be improved.

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Karl Lambert Mar 29

We have had two calls from the CDC and I have instructed my staff to NOT to speak to anyone. We will only give them what they request in writing and that is it period. They are NOT TO BE TRUSTED. Since acquiring our Multifunction Cardiogram from [heartcarecorp.com](https://heartcarecorp.com), we have filed 10 cases through [openvaers.com](https://openvaers.com) to report myocarditis in our vaccinated patients. CDC has clearly picked up on this enough to call our small nurse practitioner owned practice in a rural community. Regardless, I will not speak with

anyone from the CDC. Call it paranoia, but after 7 DOH complaints against my license during the covid pandemic--my guard and defenses are ALL UP.

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**Kathleen Baggio** Mar 28

Building the case incrementally, well done. I wonder what the "a ha" moment will finally be for those who continue to be hoodwinked. I can show ppl article after article and they just keep saying "so what - the best scientist in the world are on this and still recommend it".....as he is on his 4th. Good Grief.

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