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# A Systematic Review of Autopsy Findings in Deaths After COVID-19 Vaccination

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## Abstract

### Background

*The rapid development of COVID-19 vaccines, combined with a high number of adverse event reports, have led to concerns over possible mechanisms of injury including systemic lipid nanoparticle (LNP) and mRNA distribution, Spike protein-associated tissue damage, thrombogenicity, immune system dysfunction, and carcinogenicity. The aim of this systematic review is to investigate possible causal links between COVID-19 vaccine administration and death using autopsies and post-mortem analysis.*

### Methods

We searched PubMed and ScienceDirect for all published autopsy and necropsy reports relating to COVID-19 vaccination up until May 18th, 2023. All autopsy and necropsy studies that included COVID-19 vaccination as an antecedent exposure were included. Because the state of knowledge has advanced since the time of the original publications, three physicians independently reviewed each case and adjudicated whether or not COVID-19 vaccination was the direct cause or contributed significantly to death.

### Results

We initially identified 678 studies and, after screening for our inclusion criteria, included 44 papers that contained 325 autopsy cases and one necropsy case. The mean age of death was 70.4 years. The most implicated organ system among cases was the cardiovascular (49%), followed by hematological (17%), respiratory (11%), and multiple organ systems (7%). Three or more organ systems were affected in 21 cases. The mean time from vaccination to death was 14.3 days. Most deaths occurred within a week from last vaccine administration. A total of 240 deaths (73.9%) were independently adjudicated as directly due to or significantly contributed to by COVID-19 vaccination, of which the primary causes of death include sudden cardiac death (35%), pulmonary embolism (12.5%), myocardial infarction (12%), VITT (7.9%), myocarditis (7.1%), multisystem inflammatory syndrome (4.6%), and cerebral hemorrhage (3.8%).

**Conclusions**

The consistency seen among cases in this review with known COVID-19 vaccine mechanisms of injury and death, coupled with autopsy confirmation by physician adjudication, suggests there is a high likelihood of a causal link between COVID-19 vaccines and death. Further urgent investigation is required for the purpose of clarifying our findings.

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## Introduction

As of May 31st, 2023, SARS-CoV-2 has infected an estimated 767,364,883 people globally, resulting in 6,938,353 deaths [1]. As a direct response to this worldwide catastrophe, governments adopted a coordinated approach to limit caseloads and mortality utilizing a combination of non-pharmaceutical interventions (NPIs) and novel gene-based vaccine platforms. The first doses of vaccine were administered less than 11 months after the identification of the SARS-CoV-2 genetic sequence (in the United States, under the

Operation Warp Speed initiative), which represented the fastest vaccine development in history with limited assurances of short and long-term safety [2]. Currently, roughly 69% of the global population have received at least one dose of a COVID-19 vaccine [1].

The most frequently utilized COVID-19 vaccine platforms include inactivated virus (Sinovac – CoronaVac), protein subunit (Novavax – NVX-CoV2373), viral vector (AstraZeneca – ChAdOx1 nCoV-19, Johnson & Johnson – Ad26.COV2.S), and messenger RNA (Pfizer-BioNTech – BNT162b2, Moderna – mRNA-1273)[3]. All utilize mechanisms that can cause serious adverse events; most involve the uncontrolled synthesis of the Spike glycoprotein as the basis of the immunological response.

Circulating Spike protein is the likely deleterious mechanism through which COVID-19 vaccines produce adverse effects [4], [5], [6], [7], [8], [11], [12].

Spike protein and/or subunits/peptide fragments can trigger ACE2 receptor degradation and destabilization of the renin–angiotensin system (RAS), resulting in severe thrombosis [4]. Spike protein activates platelets, causes endothelial damage, and directly promotes thrombosis [5].

Moreover, Immune system cells that uptake lipid nanoparticles (LNPs) from COVID-19 vaccines can then systemically distribute Spike protein and microRNAs via exosomes, which may cause severe inflammatory consequences [5]. Further, long term cancer control may be jeopardized in those injected with mRNA COVID-19 vaccines because of interferon regulatory factor (IRF) and tumor suppressor gene dysregulation [5]. Moreover, a possible causal link between COVID-19 vaccines and various diseases has been found, including neurological disorders, myocarditis, blood platelet deficiencies, liver disease, weakened immune adaptability, and cancer development [5]. These findings are supported by the finding that recurrent COVID-19 vaccination with genetic vaccines may trigger unusually high levels of IgG4 antibodies which can lead to immune system dysregulation, and contribute to the emergence of autoimmune disorders, myocarditis, and cancer growth [6].

Neurotoxic effects of Spike protein may cause or contribute to the post-COVID syndrome, including headache, tinnitus, autonomic dysfunction, and small fiber neuropathy [7]. Specific to the administration of viral vector COVID-19 vaccines (AstraZeneca; Johnson and Johnson) a new clinical syndrome called vaccine-induced immune thrombotic thrombocytopenia (VITT) was identified in 2021 and characterized by the development of thromboses at atypical body sites combined with severe thrombocytopenia after vaccination [9].

The pathogenesis of this life-threatening side effect is currently unknown, though it has been proposed that VITT is caused by post-vaccination antibodies against platelet factor 4 (PF4) triggering extensive platelet activation [9]. mRNA-based vaccines rarely cause VITT, but they are associated with myocarditis, or inflammation of myocardium [10].

The mechanisms for the development of myocarditis after COVID-19 vaccination are not clear, but it has been hypothesized that it may be caused by molecular mimicry of Spike protein and self-antigens, immune response to mRNA, and dysregulated cytokine expression [10]. In adolescents and young adults diagnosed with post-mRNA vaccine myocarditis, free Spike protein was detected in the blood while vaccinated controls had no circulating Spike protein [11]. It has been demonstrated that SARS-CoV-2 Spike mRNA vaccine sequences can circulate in the blood for at least 28 days after vaccination [12]. These data indicate that adverse events may occur for an unknown period after vaccination, with Spike protein playing an important potential etiological role.

A Freedom of Information Act (FOIA) document obtained from the Australian Government, titled Nonclinical Evaluation of BNT162b2 [mRNA] COVID-19 vaccine (COMIRNATY), shows systemic distribution of the LNPs containing mRNA after vaccine administration in rats, concluding that LNPs reached their highest concentration at the injection site, followed by the liver, spleen, adrenal glands, ovaries (females), and bone marrow (femur) over 48 hours [13].

Further, LNPs were detected in the brain, heart, eyes, lungs, kidneys, bladder, small intestine, stomach, testes (males), prostate (males), uterus (females), thyroid, spinal cord, and blood [13]. This biodistribution data suggests that Spike protein may be expressed in cells from many vital organ systems, raising significant concerns regarding the safety profile of COVID-19 vaccines. Given the identified vaccination syndromes and their possible mechanisms, the frequency of adverse event reports is expected to be high, especially given the vast number of vaccine doses administered globally.

Through May 5$^{th}$, 2023, the Vaccine Adverse Events Reporting System (VAERS) contained

1,556,050 adverse event reports associated with COVID-19 vaccines, including 35,324 deaths, 26,928 myocarditis and pericarditis, 19,546 heart attacks, and 8,701 thrombocytopenia reports [14]. If the alarmingly high number of reported deaths are indeed causally linked to COVID-19 vaccination, the implications could be immense, including: the complete withdrawal of all COVID-19 vaccines from the global market, suspension of all remaining COVID-19 vaccine mandates and passports, loss of public trust in government and medical institutions, investigations and inquiries into the censorship, silencing and persecution of doctors and scientists who raised these concerns, and compensation for those who were harmed as a result of the administration of COVID-19 vaccines. Using VAERS data alone to establish a causal link between COVID-19 vaccination and death, however, is not possible due to many limitations and confounding factors.

In 2021, Walach et al. indicated that every death after COVID-19 vaccination should undergo an autopsy to investigate the mechanisms of harm [15]. Autopsies are one of the most powerful diagnostic tools in medicine to establish cause of death and clarify the pathophysiology of disease [16]. COVID-19 vaccines, with plausible mechanisms of injury to the human body and a substantial number of adverse event reports, represent an exposure that may be causally linked to death in some cases. The purpose of this systematic review is to investigate possible causal links between COVID-19 vaccine administration and death using autopsies and post-mortem analysis.

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