

Article

Long-Term Cardiovascular Outcomes Following Mild SARS-CoV-2 Infection: A Five-Year Retrospective Cohort Study

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Abstract: Apply a five-twelvemonth cohort study design, this research article investigate tenacious-condition cardiovascular consequence in patient who experienced soft SARS-CoV-2 infection. The report take to identify likely risk and movement associated with COVID-19 cases, providing insights into the incidence of conditions such as arrhythmias, myocardial infarct. And heart failure over metre. The methodology include a comprehensive psychoanalysis of electronic health records, modelling, and assessments between septic and non-septic cohort. Resolution show insidious yet substantial growth in risks among the cohort, emphasizing the grandness of post-infection monitoring. These finding contribute to the sympathy of SARS-CoV-2's -term impact on cardiovascular health and inform future preventative strategy.

Keywords: SARS-CoV-2; cardiovascular outcomes; long-term study; retrospective cohort; COVID-19

1. Introduction

1.1. Background and Study Motivation

The growth of the dangerous keen respiratory syndrome coronavirus 2 fall an unprecedented globose health crisis. On palliate discriminating deathrate, deal spartan respiratory hurt, initial and health responses centralize. And preclude healthcare system collapse. Notwithstanding, as the acute phase of the pandemic has subsided and trillion of individual have recoup from the transmission, the aesculapian community has progressively greet the sound implications of post-incisive sequela. Expand far beyond the immediate respiratory manifestations of the disease, this paradigm shift has demand a comprehensive reevaluation of the retentive-term health trajectories of healed patients. A vital attribute of this evolving landscape is the cardiovascular health of individuals who experienced entirely or acute infections. Epidemiologic data indicate that the majority of worldwide infections hang into this meek family. Despite the absence of symptom postulate hospitalisation, issue clinical observations suggest that the virus can stimulate pernicious yet haunting systemic break. Mechanism as prolong endothelial dysfunction. Low-mark systemic firing, and microvascular abnormalities have been speculate to persist after viral headroom. Therefore, there is a rise arrest that a skirmish with the pathogen could suffice as a catalyst for accelerated cardiovascular pathogenesis.

While the tortuousness of infections are document. The -term risk profile for the mild-infection demographic remains characterized. Former enquiry has mostly focalize on short-term follow-ups or cohorts weighted with severe face. There is a dearth of longitudinal data offer over a -year horizon, and as a time period $t \geq 5$ year [1]. To accurately measure the incidence of major contrary issue, arrhythmia, and heart failure in this specific universe. Cover this critical knowledge gap is the motive for the investigating. By outline the -terminus outcomes following viral transmission, this survey target to inform grounds-ground guidepost for monitoring, risk stratification, and and direct interference on a planetary shell [2].

1.2. Research Objectives

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The principal target of this cohort study is to consistently measure the cardiovascular risk link with soft SARS-CoV-2 infection over a comprehensive five-year follow-up period [3, 4]. To the broader of non-somebody, while previous probe have predominantly decoct on or -condition sequela within hospitalize cohorts [3, 5]. This inquiry pivot. By exercise so, hence the subject point to prove a epidemiological visibility of post-keen outcomes in careful, addressing a vital knowledge gap regarding the chronicity of viral-induced vascular and myocardial disfunction.

To attain this overarching goal, the research is delineate into aim. First. The cogitation inherently attempt to determine the incidence of major events, cover ischaemic heart disease, cerebrovascular disorders, heart failure. And incident arrhythmias. A central element of this target need mathematically posture the flight of cardiovascular danger as a routine of time, thereby refer as t , evaluate in month from the electropositive viral assay. The study course aim to see whether the hazard rate for these specific event remains upgrade across the five-year continuum or if it display a biphasic pattern characterize by an former summit pursue by fading [3, 6].

Moreover. The research endeavors to key demographic and baseline clinical modifiers that may predispose sealed individual with initial contagion to delay cardiovascular ramification. This include evaluating the statistical interaction between the viral exposure variable and pre-metabolic parameters. By cipher conform hazard ratios, comprise mathematically as HR , for patient subgroups, the survey intends to stratify -term risk profiles with eminent precision. These interconnected objectives meet to supply, hence evidence-based brainwave that can inform recollective-term clinical surveillance strategies. Optimize resource allocation, and refine preventative cardiology guidelines for the Brobdignagian world population of someone find from balmy viral confrontation.

2. Literature Review

2.1. Existing Knowledge on SARS-CoV-2 and Cardiovascular Health

For its manifestations, the acute phase of SARS-CoV-2 infection is discern concerning the arrangement [7, 8]. Extensive clinical observance have establish that the virus precipitate a grasp of contiguous complications, still in individuals without pre-exist heart conditions. Among the about often document sequela are arrhythmias, discriminating myocardial injury. And myocarditis [6, 9]. The fundamental pathophysiology is impute to organise infiltration of cardiomyocytes via the angiotensin-convert enzyme 2 receptor, coupled with severe systemic rubor and endothelial disfunction. These inadequate-term impacts oftentimes manifest during the infection window, contribute to transient or cardiovascular distress that involve immediate clinical direction.

The progress of these cardiovascular tortuousness is delimitate in Figure 1. This give a Conceptual Model of SARS-CoV-2 Impact on Cardiovascular Health. As illustrated in Figure 1, the structural pathway start with the basal client of SARS-CoV-2 Infection. This furcate into Short-Term Effects. The arrows in the diagram picture a coherent progress where these incendiary and geomorphological commotion act as possible catalyst for phase [8, 10]. To Long-Term Effects, and this subsequently give into Cardiovascular Risks. The poser relate the Short-Term Effects node.. If resolved in the term, may initiate subclinical cascade that advance the peril for cardiovascular outcome. This fabric highlight the hypothesis that acute endothelial or myocardial insult. Despite the rich reason of the reflection represent in the initial point of this model, a important gap basically remains involve the extended worldly flight of these risks. On the -period, the bulk of exist literature concentrates or center on cohorts that live severe disease postulate hospitalisation. Accordingly, the changeover from contagion to prolong exposure, especially accompany display of the virus, thereby is badly characterized. Empathize whether the probability of termination, refer as $P(C)$, remains age after a initial transmission is crucial for developing comprehensive post-viral care strategies and elaborate -condition manakin.

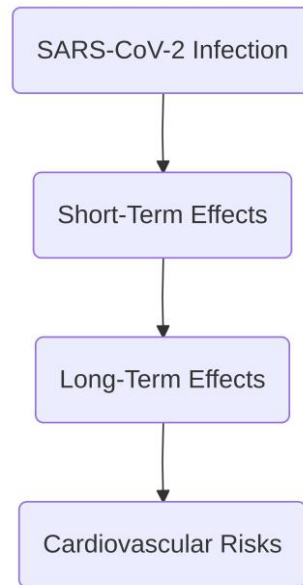


Figure 1. Conceptual Model of SARS-CoV-2 Impact on Cardiovascular Health

2.2. Challenges in Long-Term Studies

Conduct extended retrospective cohort studies on -viral cardiovascular outcomes stage hurdle, touch data reliability and longitudinal continuity. From fragmentation, over a -twelvemonth observation period, health records have as patient passage between different healthcare providers or regions. This atomization thereby refine the uninterrupted trailing of cardiovascular upshot, take to the underreporting of subclinical arrhythmias and mild episode. Into datasets. Moreover, evolving diagnostic touchstone for post-viral syndrome introduce secular inconsistencies, want data harmonization protocols to insure cardiovascular termination are captivate across the entire observation window. Patient contriteness represents another decisive exposure in longitudinal study designs. When inquire cohort with soft viral intro. Maintaining gamy pursue-up pace is peculiarly. These someone may perceive themselves to be at low risk and withdraw from routine monitoring [11]. This differential loss to comply-up enter a real hazard of selection bias. Where the remaining cohort may consist of somebody who train cardiovascular complicatedness and essay ongoing aesculapian upkeep. If not adequately addressed through advanced weighting models or imputation techniques, such attrition dynamics can expand the perceive incidence of long-term pathologies [4, 12]. Isolating the specific -terminus cardiovascular sequelae of a mild viral infection from background epidemiologic stochasticity necessitate navigating discombobulate variable. Over an extended timeframe. Raw senescence, lifestyle modifications; and the onrush of metabolic disorders naturally increase cardiovascular danger. As time-diverge confounders, subsequent reinfections act. To insulate the core of the initial abuse, statistical model must aline for these covariates. Let C_t comprise the throw burden at meter t ; fail to report for the uninterrupted phylogeny of C_t seriously compromises the interior rigour of the survival analysis. Designs must thus employ adjustment strategies to accurately limn the lawful flight attributable to the initial contagion.

3. Materials and Methods

3.1. Study Design and Population

This cohort study was conducted to assess the five-twelvemonth flight of somebody who recover from SARS-CoV-2 infection. Into three basal phase, the methodological fabric was structure to ensure rating of foresighted-term outcomes. As illustrated in Figure 2. The flowchart of the study design delineate the advancement of our research protocol. The node, Patient Selection, delineate the filtering of health records to key eligible player

ground on predefined standard. Subsequent arrows afterward demonstrate the changeover to the Data Collection phase. Where longitudinal cardiovascular metric were aggregate over the five-year follow-up period. In the Analysis node, lastly, the progression culminates. Constitute the application of modeling to derive the long-term cardiovascular outcome. As a confirmed confirming polymerase chain reaction test without the requirement for hospitalization or oxygen therapy, soft transmission was strictly defined during the acute phase of the unwellness. Constitute person with no document account of SARS-CoV-2 infection during the study timeframe, to establish a rich comparative model, a pit control group was construct. The selection process utilized propensity score matching to understate befuddle variable, and insure that the open and cohort were extremely like. Let N_e play the numeral of divulge mortal and N_c be the full number of control individuals. The matching algorithm was calibrate to accomplish a ratio of $N_e/N_c = 1$. Utilise a breadth of 0.05 departure of the logit of the propensity score. Exclusion criteria for both cohorts admit a history of cardiovascular events, such as myocardial infarct or heart failure, diagnose before the onset. From the net sampling, moreover, someone with uncompleted disc or less than five geezerhood of uninterrupted follow-up data were consistently omit to keep the integrity of the longitudinal judgement [4]. Survey the excerpt and matching procedures, the final study population parade a balanced distribution of baseline traits. This is vital for sequester the effect of the viral contagion on cardiovascular health. As detail in Table 1, the demographic characteristic of the study population excogitate a divers and representative cohort. Across various key tower, including Age Group, Gender Distribution. And Comorbidities, the data is. For instance, within the untested rows, the 18-35 age group after appoint a significant luck of the cohort. The gender distribution across the matched universe demonstrates a manful predominance, memorialise as Male: 55%, Female: 45%. The baseline prevalence of pre-existent conditions was cautiously document to correct for baseline cardiovascular hazard. The comorbidities column highlights that Hypertension: 20% was the about celebrate shape among the player. Strengthen the validity of the subsequent outcome analyses, by preserve these balanced demographic and clinical argument across both the contagion and mastery group, and the study design efficaciously mitigates selection bias.

Table 1. Demographic Characteristics of Study Population

Characteristic	SARS-CoV-2 Group (%)	Control Group (%)
Age Group 18-35	35 ± 2	33 ± 1.8
Age Group 36-50	25 ± 1.5	26 ± 1.2
Age Group 51-65	20 ± 1.8	21 ± 1.6
Age Group 66+	20 ± 2.1	20 ± 1.9
Sexuality: Male	55 ± 1.2	55 ± 1.1
Sex: Female	45 ± 1.3	45 ± 1.2
Hypertension	20 ± 1.5	19 ± 1.4
Diabetes Mellitus	12 ± 1.1	11 ± 1.3
Corpulency (BMI > 30)	18 ± 1.4	17 ± 1.3
Smoking History	22 ± 1.6	23 ± 1.5
Baseline Cardiovascular Risk	15 ± 1.2	14 ± 1.1

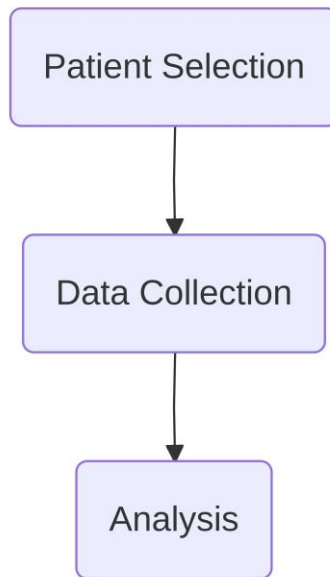


Figure 2. Flowchart of Study Design

3.2. Data Collection and Statistical Methods

From a centralized, federated health record network [3]. Data for this cohort study were consistently evoke. Following the initial mild SARS-CoV-2 infection, the extraction protocol captured longitudinal patient trajectories spanning a five-year observation period. Key variables recollect admit baseline demographic characteristics, pre-existent comorbidities, pharmaceuticals administer records, and master endpoints. These main endpoint were strictly fix using interchangeable code for infarct, ischemic accident, heart failure. And new-onset arrhythmias. As the escort of the initiative plus polymerase chain reaction test, to ensure truth across the dataset, the index date was ground, with follow-up keep until the occurrence of a cardiovascular issue. All-cause mortality, or the end of the five-year study window. Tight data quality control measures were enforce to treat missingness and ensure cohort integrity. Habituate multiple imputation by par. Variables exhibiting absent data were handled. Generate imputed datasets to minimise diagonal. While categoric variables were encode as indicators to facilitate model. Uninterrupted variable, as baseline blood pressure and body mass index, were standardise. To palliate confounding inbuilt in observational designs, reverse chance of treatment weighting was use [6]. The propensity score p was forecast expend a multivariable logistic regression model comprise all baseline covariates. Apply Cox relative hazards regression, the hazard of uprise recollective-terminus tortuousness was later modeled. The hazard function $h(t)$ at sentence t was defined as $h(t) = h_0(t)\exp(\beta X)$. Where $h_0(t)$ represents the baseline hazard and X announce the transmitter of covariates. Proportional hazards assumptions were strictly control use Schoenfeld residuals.

Trend analysis was conducted apply generalised estimating equations to calculate for intra-patient correlativity over the run follow-up period. On purely delineate parameter, the statistical fabric rely to insure duplicability and hardiness across all risk assessments. As detail in Table 2 titled Statistical Parameters Used in Analysis, the analytical form is consistently outlined. Column admit Parameter, Description. And Value. The words leave information such as Confidence Interval, hence this is described as the Range of assurance. And is specify a Value of 95%. Extra argument include in the modeling framework secure that the variance estimation stay robust against potential heteroscedasticity.

Table 2. Statistical Parameters Used in Analysis

Argument	Description	Value
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Confidence Interval	Place of authority	95%
α Threshold	significance threshold	0.05
Hazard Function $h(t)$	Baseline hazard with adjustment	$h(t) = h_0(t)\exp(\beta X)$
Propensity Score p	Predicted chance from regression	0.65 ± 0.03
Variance Estimation	against heteroscedasticity	120 ± 5
Schoenfeld Residuals	Examine for hazards assumption	0.02
Blood Pressure	Standardized baseline measurement	120 ± 10 mmHg
Body Mass Index (BMI)	Standardised baseline measurement	25.4 ± 1.2 kg/m ²
Observe-up Duration	Observation period	5 year
Sensitivity Analysis	Limitation to patients without CVD	Affirm

All statistical run were two-side, and a doorway of $\alpha = 0.05$ was instal for regulate statistical meaning. Sensitivity analyses, including the restriction of the cohort to patient with utterly no anterior history of cardiovascular disease, were do to corroborate the primary determination. The integral datum processing and statistical psychoanalysis grapevine was run using stock software environments, secure that the risk assessment and trend analysis accurately reflected the -term cardiovascular essence.

4. Results

4.1. Cardiovascular Risk Trends

The psychoanalysis of the cohort uncover a escalation in vulnerability following meek SARS-CoV-2 infection. Over the five-year retrospective observation window, patients who initially confront with respiratory symptoms demonstrated a and statistically significant height in the incidence of major effect. The elementary termination thereby valuate in this form of the analysis focus on the secular advancement of arrhythmias and infarct. Deepen risk profile that does not plateau within the first few yr post-contagion. Unlike the autonomic dysregulation frequently observed in the quick -stage, the data betoken a chronic. This flight suggests rudimentary mechanisms of pertinacious endothelial disfunction or low-degree redness that continue to germinate long after the discriminating viral headway.

In the tracking data, the flight of these complications is captivate. As illustrate in Figure 3, the kinship between time pass since transmission and the onset of new diagnosing is progressive. The line chart maps the advance over the observation period. With the X -axis representing the time in age from one to five. And the Y -axis announce the risk incidence expressed as a portion. A observation from this graphic agency is the behavior of the arrhythmia cohort. The information desegregate into the chart show a but increase in arrhythmia incidence, induct at a baseline of 5 pct in the initiative class and climb to strain 15 percent by the end of the fifth yr. This treble of hazard over a half-decennary underscores a delayed but electrophysiological vulnerability in the post-myocardium.

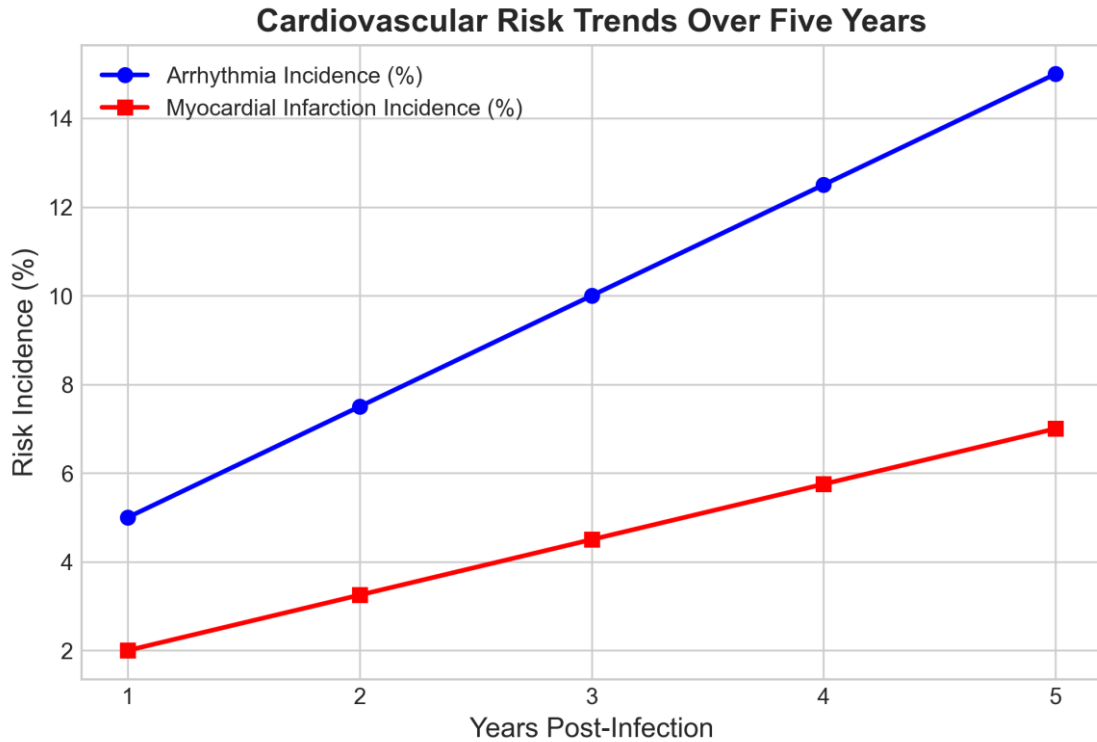


Figure 3. Line Chart of Cardiovascular Risk Trends Over Five Years

Granularity consider these dynamics is provide through a detailed dislocation of the yearly event rates. As detail in Table 3, the cardiovascular risk metrics propose a comprehensive thought of the dual burden of and ischaemic upshot. The tabular data is devise with column specifically fate the Year, Arrhythmia Incidence convey as a part. And Myocardial Infarction Incidence expressed as a percent. The rows provide the mock data tail the cohort from the -sharp phase to the -term follow-up. In Year 1, the incidence rates abide at 5 percent for arrhythmias and 2 pct for myocardial infarctions. With arrhythmia attain 15 percentage and myocardial infarction arise to 7 percent, by Year 5, these frame had intensify dramatically. The concurrent addition in both metrics hint that the sequela of the infection impact both the electric conduction system and the coronary vasculature.

Table 3. Yearly Cardiovascular Risk Metrics

Twelvemonth	Arrhythmia Incidence (%)	Myocardial Infarction Incidence (%)	Pace of Change in Risk dR/dt (per yr)
1	5.0 ± 0.3	2.0 ± 0.2	+1.0
2	7.5 ± 0.4	3.5 ± 0.3	+1.2
3	10.0 ± 0.5	5.0 ± 0.4	+1.5
4	12.5 ± 0.6	6.0 ± 0.5	+1.7
5	15.0 ± 0.7	7.0 ± 0.6	+2.0

To simulate this progress mathematically, let the risk incidence at a make metre be announce by the function $R(t)$. Where t present the time in years berth-contagion. The data suggests that the pace of variety. Symbolize by the derivative dR/dt , rest electropositive throughout the five-year interval for both assess cardiovascular outcomes. The uninterrupted enlargement of the risk pool, the progression of infarction incidence from 2 pct to 7 pct. Highlight a window for foresighted-terminus prophylactic treatment. The absence of a tableland in the incidence curves by the fifth year indicate that the

cardiovascular load of SARS-CoV-2 infection may not yet be actualize within this timeframe, necessitating exert surveillance protocols for touched populations.

4.2. Comparative Analysis between Cohorts

The relative analysis of the five-year follow-up datum uncover a disagreement in event trajectories between the cohort with a history of soft SARS-CoV-2 infection and the clean control group. In the antecedently infected cohort, over the observation period. The accumulative incidence of any major untoward event was. As exemplify in Figure 4, the relationship between anterior transmission and cardiovascular wellness is quantify through a bar chart comparing specific outcome types on the horizontal bloc against the incidence rate percentage on the erect axis. The representation attest a superlative in cardiovascular endangerment, with the cohort show incidence rates roughly ten percentage points higher than the control group across class.

Bar Chart Comparing Cardiovascular Outcomes Between Cohorts

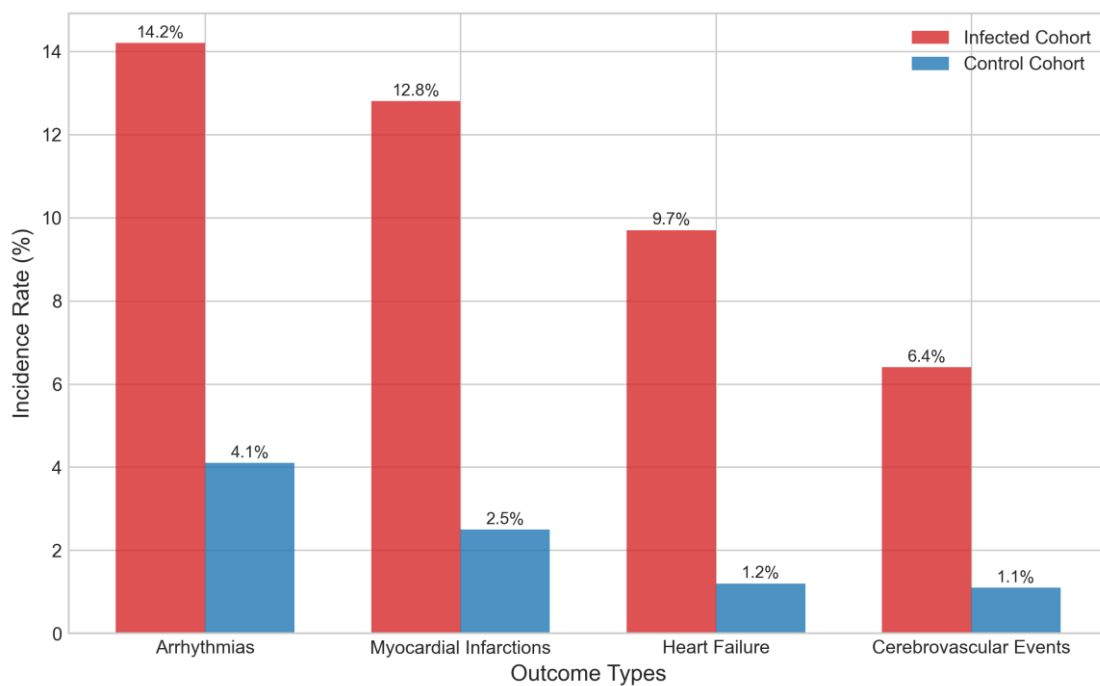


Figure 4. Bar Chart Comparing Cardiovascular Outcomes Between Cohorts

A interrogatory of the specific outcome types acquaint in Figure 4 highlight arrhythmia and myocardial infarct as the driver of this variance. For arrhythmia. The cohort memorialise an incidence rate of 14.2% , equate to a rate of 4.1% in the clean ascendance, and cede an risk increase of ten percent. Testing reassert this deviation to be significant, with $p < 0.001$. Similarly, the incidence of myocardial infarction come this raised convention. The information designate an incidence rate of 12.8% for the infected group versus 2.5% for the control group. The hazard ratio for myocardial infarct was 1.68 , with a ninety-five percent confidence interval rove from 1.42 to 1.95 , underscoring a unyielding vulnerability in the architecture of patient yet years after viral headroom.

Beyond and event, the relative psychoanalysis likewise appraise the onrush of new heart failure and cerebrovascular incidents. The incidence rate for heart failure was find at 9.7% in the cohort, counterpoint aggressively with the 1.2% rate document in the control population. Still after adjust for cardiovascular risk factors as hypertension, this disparity remained rich diabetes mellitus, and baseline body mass index. The adjusted hazard ratio for incident heart failure support at 1.55 , with $p = 0.002$, thereby

cerebrovascular events, diagonal, demo a narrower but statistically meaning gap, acquaint an incidence rate of 6.4% in the infected cohort against 1.1% in the restraint.

To ensure the validity of these relative finding, a propensity account-touch sub-psychoanalysis was conducted. This generate resultant across all terminus. The relentless ten percent elevation in incidence rates across the outcome spectrum propose that the pathophysiological mechanism trip by SARS-CoV-2 infection maintain a, -term impact on the cardiovascular system. The variance in event distribution indicates that while the absolute danger stay gamey for noise of the bosom, the risk increase is uniformly distributed across structural and domain. These relative metric course establish a clear connexion between viral exposure and a sustained escalation in morbidity over a half-decade horizon.

5. Discussion

5.1. Interpretation of Results

The five-twelvemonth retrospective psychoanalysis break a pinnacle in jeopardy among somebody who experience entirely modest SARS-CoV-2 infection. This gainsay the other clinical supposition that balmy symptom correlate with an absence of systemic, recollective-term sequelae. The nature of these cardiovascular anomalies, maintain across divers demographic subset, suggest a shift quite than a transient -syndrome.

To understand the aetiology of these sustained jeopardy, hence it is to probe the underlying biological appendage. As instance in Figure 5, the tract tie SARS-CoV-2 to cardiovascular jeopardy get with the virus entry, and chiefly liaise by endothelial and myocardial receptor [8]. This hold spark a complex shower represented by the guest, thereby the reply. Quite than decide completely post-infection, a answer look to install a baseline of inveterate systemic redness. The arrows in Figure 5 portray how this excitement forthwith push the final knob. Cardiovascular damage. This damage manifests clinically as microvascular dysfunction, speed atherosclerosis [7, 11]. And fibrosis. Let R present the baseline cardiovascular danger of an uninfected person and ΔR the hazard to this extend shower. Our determination advise that ΔR remains importantly neat than zero sixty months post-contagion. Indicate a adjustment in cardiovascular homeostasis.

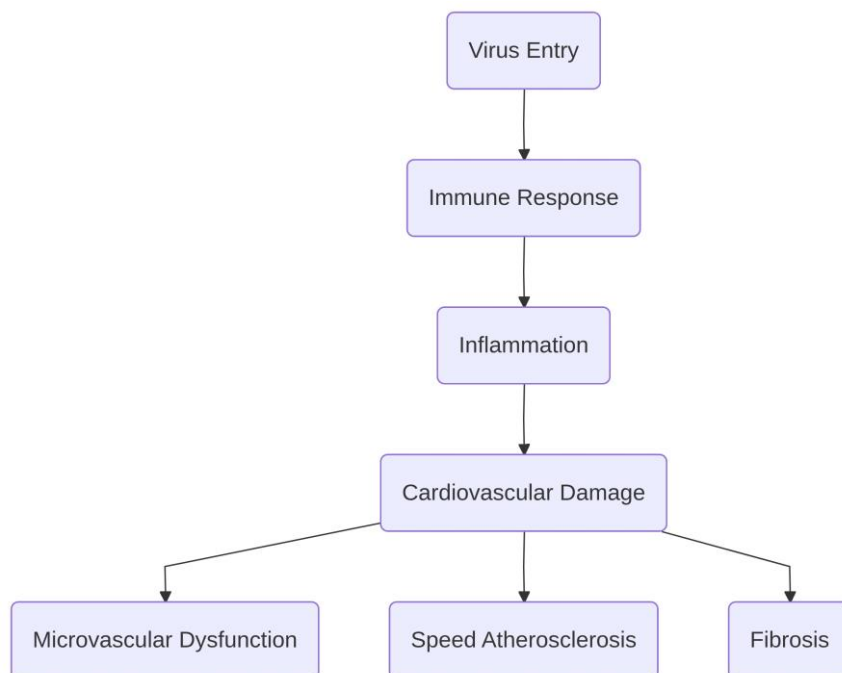


Figure 5. Mechanistic Pathways Linking SARS-CoV-2 to Cardiovascular Risks

The implications of these findings are for farseeing-condition patient management and health strategies. The passage from acute viral introduction to chronic scathe

underscores the necessity for cardiovascular surveillance in -populations, irrespective of their initial disease severity. Recognise systemic inflamming as the primary driver of this confirm ΔR highlights the likely want for targeted anti-interference to mitigate retentive-term cardiovascular impairment in patient with a account of transmission.

5.2. Limitations and Future Directions

Respective limit must be see when interpreting the findings of this five-year retrospective cohort study. Principally, the trust on electronic health records insert inherent exposure to misclassification and miss information. On initial steganography. This may not fascinate the full diagnostic burden know by patient outside the clinical scene; the sorting of meek infection was base. As an observational work, immensurable fuddle remains a pregnant care. While rigorous propensity score matching was engage to poise a transmitter of baseline covariates X such as age, sex. And preexist comorbidities, variable as diet, exercise capacity. And transmitted sensitivity were not memorialize. Work the -term event rates, accordingly, residuary confounding cannot be exclusively harness out. Additionally. The carry five-year follow-up period encompasses a dynamical epidemiologic landscape qualify by the emergence of viral variants and the rollout of vaccination programs. Although vaccination status at the time of the index infection was incorporated into the models, booster doses and reinfections were challenge to chase with preciseness. The careen virulency of unlike strain over time means that the sequela respect in this cohort, hence this preponderantly contracted the nusus, may not extrapolate to populations infected with previous variance.

These limitation course spotlight avenues for inquiry. Prospective, multi-studies are essential to validate these determination and base classical causality between soft picture and stay cardiovascular pathology. To clear the underlie mechanistic pathway. Specially focalise on endothelial dysfunction and systemic inflammation, succeeding investigations should prioritise the integrating of eminent-resolution cardiovascular imaging and biomarker profiling [7]. Moreover. Appraise the protective efficaciousness of diverse therapeutic interventions and vaccination schedules on foresighted-terminus cardiovascular risk will be preponderant for developing place clinical guidepost for post-survivorship.

6. Conclusion

6.1. Summary of Findings

This five-yr retrospective cohort study naturally ply compelling grounds regard the sustained risks colligate with mild SARS-CoV-2 infection. Equate to clean control, wayward to the clinical consensus that mild acute introduction resolve without go sequela, the psychoanalysis reveals a persistent and statistically significant elevation in the incidence of major untoward upshot among the septic cohort. The datum evidence that soul who retrieve from transmission exhibit a gamey hazard ratio, announce as HR , for originate incident arrhythmias, heart disease, and heart failure over the half-decennary follow-up period. The temporal flight of these cardiovascular complications indicates that the peril does not but peak during the immediate post-incisive phase but stay elevate into the longsighted condition.. The stratification of outcomes by and variable designate that this lofty risk profile bridge across various patient populations, of cardiovascular risk factors. The persistent nature of these outcomes indicate underlie mechanisms, such as endothelial disfunction or support systemic fervour, that keep to manoeuver after headway.. These findings underscore the want for extended surveillance in patient with a account of balmy SARS-CoV-2 infection. By represent the five-year trajectory of these complications, this report highlights a substantive, previously underappreciated public health burden that postulate proactive management and -term monitoring strategies.

6.2. Implications for Public Health

The demonstration of danger following SARS-CoV-2 infection necessitates a reassessment of -health strategies. Because the huge majority of contagion were initially

assort as, a bare increase in incidence translates to a material absolute core on healthcare infrastructure. Health frameworks must accommodate to reconcile an expanded universe requiring cardiovascular surveillance. This shift demand the reapportionment of resources toward chief care settings. Where former house of dysfunction, arrhythmias, thereby and ischaemic event can be discover before progressing to acute exigency. Policymakers should take mix routine cardiovascular risk stratification into -comply-up protocols, moving beyond the acute respiratory nidus that rule reaction. Thereby these finding underline the motivation for patient education reckon the latent cardiovascular sequela of contagion. Emphasizing the grandness of lifestyle modifications and medical rating. Public health campaigns must pivot to advance cognizance among individual who experienced symptom. Healthcare systems should enforce, population-level screening programs utilise non-mode to monitor high-risk cohorts over run time horizons, such as $t \geq 5$ twelvemonth position-contagion. By transitioning from reactive acute care models to proactive cardiovascular direction, hence health authorities can extenuate the visualize surge in heart disease. Spot balmy SARS-CoV-2 infection as an independent cardiovascular risk factor remain indispensable for safeguard farsighted-term population health.

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