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Hidden and Atypical Presentations of Myocarditis in Sudden Cardiac Death: A Narrative Review

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Abstract

Background: Myocarditis is an inflammatory disease of the heart muscle, presenting from asymptomatic cases to sudden cardiac death. Its diagnosis is challenging, especially when classic cardiac symptoms are absent presents with unusual manifestations. Recognition of these unusual manifestations is essential to prevent sudden death and increase clinical awareness.

Methods: This narrative review was conducted to summarize the evidence on myocarditis with occult and nonclassical manifestations and its role in sudden cardiac death. A systematic search was performed in PubMed, Scopus, Embase, Cochrane Library, and Google Scholar for studies published between 2000 and 2025. Search terms included English language, such as "myocarditis," "sudden cardiac death," "atypical presentation," "silent myocarditis," and "gastrointestinal symptoms".

Results: A total of 10 studies were included and analyzed, focusing on clinical characteristics, nonclassical presentations, diagnostic findings, and outcomes. Myocarditis can be insidious and asymptomatic in young patients and increases the risk of sudden cardiac death. The diagnosis of these cases is often only possible after cardiac arrest or autopsy. In addition, myocarditis may present with nonclassical symptoms, particularly gastrointestinal symptoms, delaying diagnosis.

Conclusion: Myocarditis, whether asymptomatic or with nonclassical manifestations such as gastrointestinal symptoms, can be a serious health threat, especially in young people, and in some cases can cause sudden cardiac death. Evidence suggests that many of these deaths in apparently healthy individuals are due to undiagnosed myocarditis. Early recognition and attention to nonclassical symptoms are essential to prevent sudden death and improve patient management.

Keywords: Myocarditis, Sudden cardiac death, Atypical presentation, Silent myocarditis, Gastrointestinal symptoms

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Introduction

Myocarditis is an inflammatory disease of the heart muscle that has a wide spectrum of clinical manifestations, from asymptomatic cases to severe heart failure and sudden cardiac death (1). Diagnosis of this disease is often challenging, especially when classic cardiac symptoms such as chest pain and shortness of breath are absent, and the patient presents with unusual or occult symptoms (2).

These nonclassical manifestations, including gastrointestinal symptoms, can delay timely diagnosis and increase the risk of fatal arrhythmias and sudden death (3). Occult and nonclassical symptoms of myocarditis are often observed in young patients, which can lead to sudden death without warning in critical cases (4). Epidemiological studies suggest that myocarditis is responsible for 8–12% of sudden cardiac deaths in people under 40 years of age (5). Athletes show 7-10% SCD-myocarditis rate; 81% male, mean age 17y, often post-viral prodrome (6). Previous studies have suggested that many cases of sudden cardiac death in young people may be associated with myocarditis, even if there are no obvious cardiac symp-

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Key Messages:

↑What is "already known" in this topic:

Myocarditis, an inflammatory disease of the heart muscle, is responsible for 8-12% of sudden cardiac deaths in people under 40 years of age.

→What this article adds:

Maintaining a high index of suspicion for myocarditis in patients presenting with atypical symptoms may support earlier diagnostic evaluation and improved clinical awareness.

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toms. Therefore, recognition and investigation of these unusual presentations are essential to increase clinical awareness and prevent sudden events.

Recent evidence indicates that myocarditis, whether occurring in latent and asymptomatic forms or presenting with nonclassical manifestations such as gastrointestinal symptoms, represents a serious and often underestimated public health threat, particularly among young individuals (7). A substantial proportion of sudden cardiac deaths in apparently healthy populations has been attributed to undiagnosed myocarditis, suggesting that clinically silent or minimally symptomatic forms may still carry a significant risk of fatal outcomes. Myocarditis Foundation reports up to 20% of young adult SCD due to myocarditis, often in athletes with viral prodrome (8). Post-COVID myocarditis shows 10.9% arrhythmic SCD risk despite mild presentation. This underscores the importance of careful attention to vague, nonspecific, and even extracardiac symptoms, as many affected patients do not experience classic cardiac manifestations such as chest pain or dyspnea, leading to delayed diagnosis and missed opportunities for prevention (9).

Moreover, growing evidence suggests that common gastrointestinal infections, including those caused by Campylobacter jejuni and Salmonella enterica, may precede the development of acute myocarditis, with initial clinical manifestations in many cases being confined solely to gastrointestinal symptoms. GBD analysis shows myocarditis ASIR rising globally, especially in high-income countries with better diagnostics revealing occult burden (10). This heterogeneity in clinical presentation patterns highlights the necessity of increasing clinical awareness, particularly when evaluating patients with nonclassical symptom profiles, as early recognition of these atypical trajectories may play a decisive role in preventing severe cardiac complications and sudden death. This narrative review aimed to summarize the available evidence on myocarditis with occult and unusual presentations and to investigate its role in sudden cardiac death, with particular emphasis on cases presenting with gastrointestinal or nonclassical symptoms.

Methods

Study Design

This study was designed as a narrative review aimed at comprehensively summarizing and critically analyzing the available evidence on myocarditis with occult and atypical presentations and its potential contribution to sudden cardiac death.

Search Strategy

To enhance methodological transparency and reproducibility, a structured and comprehensive literature search was conducted across multiple electronic databases, including PubMed, Scopus, Embase, Cochrane Library, and Google Scholar. The search covered studies published from January 2000 to March 2025. The search strategy combined Medical Subject Headings (MeSH) and free-text terms using Boolean operators (AND, OR). A representative database-specific search strategy was as follows: ("myocarditis" OR "inflammatory cardiomyopathy") AND ("sudden cardiac death" OR "SCD") AND ("atypical presentation" OR "silent" OR "subclinical" OR "occult" OR "unusual manifestations" OR "gastrointestinal symptoms"). Where applicable, filters such as publication date and human studies were applied. In addition, the reference lists of relevant articles were manually screened to identify further eligible studies.

Study Selection Process

The study selection process was conducted in two sequential stages. First, titles and abstracts were screened to identify potentially relevant studies. Subsequently, full-text articles were assessed for eligibility based on predefined inclusion and exclusion criteria. To improve reporting transparency, a PRISMA-style flow diagram was constructed to illustrate the process of study identification, screening, eligibility assessment, and final inclusion (Figure 1).

Inclusion and Exclusion Criteria

Studies were included if they met the following criteria: (1) published in English; (2) addressed myocarditis in the context of sudden cardiac death or its clinical spectrum; and (3) specifically reported atypical, subclinical, silent, or nonclassical presentations. The restriction to English-language studies was applied due to feasibility constraints and resource limitations. Studies were excluded if they: (1) focused exclusively on typical or clinically overt myocarditis; (2) lacked sufficient clinical, pathological, or diagnostic data; or (3) were non-original articles such as editorials, commentaries, or studies with inaccessible full texts.

Data Extraction

Data extraction was performed systematically from all included studies. The extracted variables included study design, patient characteristics, Exposure (Index Technique), Comparison Group, Primary Outcome, Secondary Outcomes, Key Findings, and Adverse Events / Safety.

Data Synthesis

Given the narrative nature of this review, data were synthesized qualitatively using a thematic and interpretative approach. The focus was placed on identifying patterns of atypical presentations and their clinical implications in sudden cardiac death. No quantitative synthesis or meta-analysis was performed.

Results

A total of 10 publications were included (Figure 1), and their characteristics are summarized in Table 1. The included studies comprised a combination of autopsy-based investigations, case reports, case series, and a limited number of clinical (non-fatal) studies. While a substantial proportion of the evidence was derived from post-mortem analyses of sudden cardiac death, several reports also described non-fatal atypical presentations of myocarditis, particularly those initially manifesting with noncardiac symptoms such as gastrointestinal complaints. It is im-

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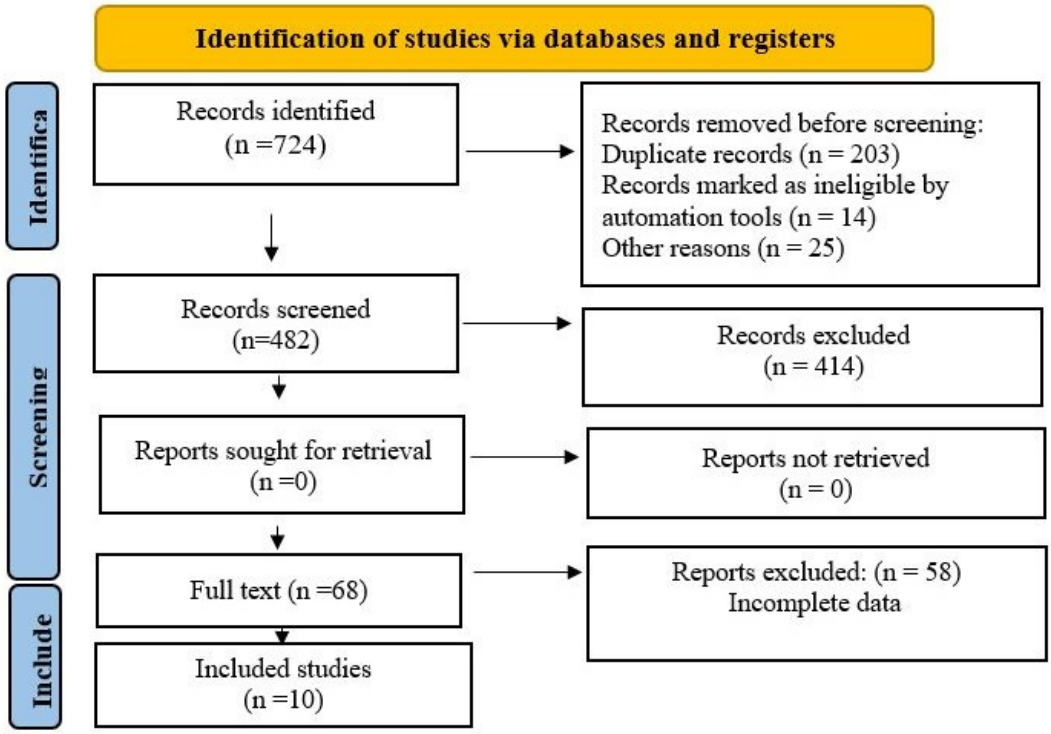

Figure 1. PRISMA 2020 Checklist.

portant to note that the predominance of autopsy-based and fatal cases in the included literature may introduce selection bias, as these studies inherently focus on the most severe spectrum of the disease. Consequently, non-fatal and clinically recognized atypical presentations of myocarditis may be underrepresented.

A study by Gaaloul et al. (2021) (11) focused on sudden deaths associated with enterovirus-induced myocarditis. The aim of this study was to examine the pathological, immunohistochemical, and molecular diagnosis of post-mortem myocarditis.

Shanmugam et al. (2015) (12) reported a rare case of sudden cardiac death in a previously healthy adult male caused by idiopathic giant cell myocarditis (IGCM), which was diagnosed only at autopsy. The patient had no prior cardiac symptoms or known comorbidities and collapsed suddenly during routine daily activity. Histopathological examination revealed extensive myocardial necrosis with multinucleated giant cells and inflammatory infiltration, while the coronary arteries were patent. This case highlights that myocarditis… may remain clinically silent and, in severe cases, present as sudden unexpected death, although non-fatal atypical presentations have also been reported, emphasizing the diagnostic limitations of clinical evaluation and the critical role of post-mortem pathological examination in identifying occult inflammatory cardiac diseases. Prospective postmortem studies confirm myocarditis in 8.6% young adult SCDs, frequently without prior symptoms (13).

Another study by Ottaviani et al. (2020) (14) focused on sudden death in patients with arrhythmogenic cardiomyopathy and examined the cardiac conduction system. The aim of this study was to identify pathological features of the cardiac conduction system that lead to sudden cardiac arrest. The results showed that even in the absence of clinical cardiac symptoms, conduction system abnormalities and histological changes can cause sudden death. The study emphasized that occult myocarditis and cardiomyopathic disorders can increase the risk of SCD without any prior warning.

Callon et al. (2018) (15) examined the combined role of these factors in sudden death in a series of autopsies on patients with viral myocarditis associated with genetic cardiomyopathy. The aim of the study was to identify pathological features and evidence that could explain why some young patients develop sudden cardiac arrest without any fatal cardiac symptoms. This study demonstrated that the interaction between myocarditis and the genetic background of the heart can lead to rapid and unpredictable myocardial damage, even when there are no obvious clinical symptoms.

Also, the study by Fnon et al. (2017) (16) investigated the pathological features of sudden death associated with myocarditis in Egypt. They aimed to identify histological patterns and cardiac changes that could explain why young asymptomatic patients suddenly die. The results of this study showed that almost all cases of sudden death in this series were associated with myocardial inflammatory changes, even when the patient had no cardiac symptoms, emphasizing that early diagnosis in these cases is very difficult due to the latent nature of symptoms.

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Table 1. Clinical and demographic information in selected studies

Article	Country	Study Design	Sample Size	Exposure (Index Technique)	Comparison Group	Primary Outcome	Secondary Outcomes	Key Findings	Adverse Events / Safety	Notes
Gaaloul 2012	Tunisia	Prospective post-mortem observational study	48 sudden unexpected death victims; 37 control cases (traffic accident victims)	Post-mortem myocardial examination using: histopathology (H&E), immunohistochemistry (CD3-T cells, CD19-B cells, enteroviral VP1 protein), molecular pathology (RT-PCR for enterovirus RNA)	Control group: 37 unnatural traffic accident deaths without cardiac pathology	Detection of viral myocarditis (enterovirus) post-mortem via histopathology, immunohistochemistry, and RT-PCR	Quantification of T and B lymphocytes (CD3, CD19); identification of enterovirus type (CVB1, CVB3)	12.5% (6/48) of sudden death victims were positive for enterovirus; VP1 capsid protein detected in myocardium; significant infiltration of CD3-T and CD19-B lymphocytes; controls were negative; RT-PCR confirmed CVB3 in 5 cases, CVB1 in 1 case; combined histopathology, immunohistochemistry, and molecular pathology improved detection of myocarditis	Not applicable (post-mortem study)	Young adult males (18–42 y) without prior cardiac disease; samples collected ≤12 h post-mortem; first such study in Tunisia
Ottaviani 2021	Italy	Retrospective post-mortem observational study over 34 years (1987–2021)	1,109 consecutive autopsies reviewed; 23 cases diagnosed with arrhythmogenic cardiomyopathy (ACM), including 20 sudden unexpected cardiac death (SUCD) cases and 3 native explanted hearts	Post-mortem cardiac examination: macroscopic analysis, histopathology (H&E, Trichromic Heidenhain/Azan) with detailed serial sections of the cardiac conduction system (SAN, AVJ, AVN, His bundle, bundle branches)	Non-ACM age-matched SUCD cases (n = 15)	Detection of structural abnormalities of the cardiac conduction system (CCS) and ventricles in ACM, and their association with SUCD	Demographics, macroscopic heart features, biventricular involvement, CCS histopathological findings (SAN/AVJ hypoplasia, AVJ dispersion/septation, LBB block, Mahaim fibers, CFB hypoplasia)	Most ACM cases are male (69.6%), with a mean age of 36.1 y; RV dilation, fibrofatty replacement; CCS abnormalities in SUCD cases; arrhythmias caused by myocardial and CCS disruption	Not applicable (post-mortem study)	Long-term 34-year study; PKP2 mutation identified; importance of CCS examination
Callon 2024	France	Post-mortem autopsy series with histological, immunohistochemical, virological, and genetic analyses	4 sudden death cases (children and young adults, aged 4–60 y)	Post-mortem myocardial exam: H&E histopathology, IHC (CD3, CD68), PCR/qPCR (Enterovirus, PVB19, HHV6, VZV, EBV), NGS (59 genes)	Not applicable	Identification of sudden cardiac death (SCD) due to genetic cardiomyopathy + viral myocarditis	Viral load quantification, genetic variant classification, and family screening recommendations	Viro-genetic interaction (PVB19, HHV6, etc.) triggered fatal arrhythmias in genetically susceptible hearts.	Not applicable	Viral myocarditis may induce or interact with genetic susceptibility
Lynge 2019	Denmark	Nationwide population-based observational study of SCD with autopsy confirmation	14,294 deaths (age 1–49 years); 1,363 SCD identified; 753 autopsied	Autopsy-confirmed myocarditis using histopathology (Dallas criteria); virology/toxicology in selected cases	SCD cases from other causes (n = 711 autopsied; n = 610 non-autopsied)	Incidence of myocarditis-related sudden cardiac death	Age/sex distribution, comorbidities, influenza-like symptoms, and toxicology findings	6% of SCD due to myocarditis; incidence 0.16 per 100,000 person-years; most cases are asymptomatic before death	Not applicable	Large nationwide registry; underdiagnosis suggested
Shanmugam 2015	India	Case report (autopsy-based)	1 case (33-year-old male)	Autopsy histopathology confirming idiopathic giant cell myocarditis	None	Sudden cardiac death due to giant cell myocarditis	Gross and microscopic cardiac pathology	IGCM diagnosed only at autopsy; coronary arteries normal; sudden, unexpected death	Not applicable	Rare fatal disease; diagnosis post-mortem

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Table 1. Cont

Article	Country	Study Design	Sample Size	Exposure (Index Technique)	Comparison Group	Primary Outcome	Secondary Outcomes	Key Findings	Adverse Events / Safety	Notes
Fnon 2025	Egypt	Retrospective cross-sectional autopsy-based study	652 autopsied cardiac deaths; 42 myocarditis deaths (6.4%)	Histopathology using Dallas criteria; subtyping into neutrophilic, lymphocytic, eosinophilic, and giant cell myocarditis	Other autopsied sudden cardiac deaths without myocarditis	Proportion and characteristics of myocarditis among SCD	Age/sex distribution, infection history, gross cardiac findings, histologic subtype	Myocarditis caused 6.4% of SCD; neutrophilic predominant (71%); most hearts grossly normal	Not applicable	First forensic myocarditis series in Arab world; 86% missed on gross exam
Costa 2025	Portugal	Case series	2 adolescents	C. jejuni infection → ECG, biomarkers, CMR (LGE), echo	None	Development of myocarditis after gastroenteritis	Cardiac imaging outcomes (CMR, LGE), treatment response	Myocarditis confirmed by CMR; one relapse case requiring colchicine	No malignant arrhythmias or hemodynamic collapse; one recurrence	CMR essential diagnostic tool
Suehiro 2023	Japan	Single case report	1	C. jejuni enteritis with ECG, biomarkers, echo, CMR, biopsy	None	Acute myocarditis secondary to infection	Imaging and histology (CD4-dominant infiltrate)	Full recovery; autoimmune mechanism suggested	No fulminant course	Rare complication of C. jejuni
Zouganeli 2024	Greece	Case report + literature review	1	C. jejuni gastroenteritis with troponin, ECG, CMR	None	Myocarditis after gastroenteritis	Biomarkers, imaging, clinical course	Mild myocarditis with full recovery	No shock or heart failure	Highlights the diagnostic challenge
Sumana 2025	India	Case report	1	Salmonella enterica serovar Weltevreden infection	None	Myocarditis following gastroenteritis	ECG changes, clinical course	Rare NTS-associated myocarditis; full recovery	Mild pleural effusion	First reported Weltevreden-associated myocarditis

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Table 2. Diagnostic features and clinical clues across included studies

Diagnostic Domain	Findings Across Studies
Clinical Presentation	Gastrointestinal symptoms (diarrhea, fever, abdominal pain), nonspecific viral-like illness, fatigue, or absence of cardiac symptoms
ECG Findings	Nonspecific ST-T changes, arrhythmias, conduction abnormalities; normal ECG in early or mild cases
Biomarkers	Elevated troponin and CK-MB increase even without chest pain
Imaging (CMR)	Myocardial edema, late gadolinium enhancement (LGE), and reduced LVEF in acute cases.
Post-mortem Findings	Lymphocytic or neutrophilic myocarditis, myocardial necrosis, and inflammatory infiltrates
High-Risk Clues	Young age, preceding infection (especially GI infections), syncope, unexplained collapse
Diagnostic Gold Standard	Endomyocardial biopsy or autopsy confirmation

Finally, Lyngea et al. (2019) (5) conducted a national study in Denmark on 14,294 cases of sudden cardiac death due to myocarditis in people aged 1 to 49 years. The aim of this study was to investigate the frequency of sudden death associated with myocarditis in the population and the age and sex patterns. Their results showed that a significant percentage of sudden cardiac deaths in young patients were due to myocarditis, and a large proportion of these cases had no previous cardiac symptoms, which strongly highlights the importance of early diagnosis and clinical awareness.

A study by Costa et al. (2019) (17) reviewed a series of cases of Campylobacter-induced cardiac involvement. The aim of this study was to describe the spectrum of clinical presentation in patients who initially presented with gastrointestinal symptoms such as fever, diarrhea, and abdominal cramps, but subsequently developed acute myocarditis. The findings showed that the initial symptoms were highly nonspecific, and in some patients, there were no obvious cardiac symptoms before the onset of heart failure. This suggests that the risk of cardiac involvement should be taken seriously in some gastrointestinal infections.

Similarly, Suehiro et al. (2020) (18) reported a case of a patient with myocarditis due to Campylobacter jejuni infection. The aim of this report was to demonstrate that common gastrointestinal infections can, in rare cases, rapidly involve the heart. In this patient, the initial symptoms included diarrhea and fever, but a few days later, the patient presented with chest pain and elevated cardiac markers. Their report emphasizes that physicians should be alert to the possibility of myocarditis following gastrointestinal infections, even when cardiac symptoms are mild or vague.

In another study, Zouganeli et al. (2018) (19) presented a case report and literature review to investigate the role of Campylobacter in the development of myocarditis. Their aim was to analyze the possible mechanisms of association between gastrointestinal infection and direct or indirect myocardial injury. The findings suggested that cardiac involvement may be due to an overactive immune response or direct toxic effects of the bacteria. Also, some patients presented only with general symptoms such as weakness, nausea, or fever, which made the diagnosis of myocarditis more difficult.

Also, Sumana et al. (2021) (20) reported a rare case of myocarditis associated with Salmonella enterica serovar Weltevreden infection in a physician. The aim of this study was to describe the clinical course of the patient who initially presented with only diarrhea and gastrointestinal symptoms and no complaints of chest pain or cardiac manifestations. However, a few days after the onset of gastrointestinal symptoms, the patient developed acute heart failure. This case highlights the importance of considering myocarditis even in relatively simple and common gastrointestinal infections.

Diagnostic-focused

In addition to clinical descriptions, several recurring diagnostic patterns were identified across the included studies. Elevated cardiac biomarkers, particularly troponin, were frequently reported in non-fatal cases of myocarditis, even in the early stages of presentation. Electrocardiographic abnormalities ranged from nonspecific ST-T changes to arrhythmias in both symptomatic and initially asymptomatic patients. In fatal cases, post-mortem histopathological examination remained the definitive diagnostic modality, often revealing myocardial inflammation in the absence of prior clinical suspicion (Table 2).

In a subset of non-fatal cases, CMR demonstrated myocardial edema and late gadolinium enhancement, supporting its role as a key non-invasive diagnostic tool. Importantly, some patients with gastrointestinal prodromal symptoms initially had non-specific clinical findings, with diagnosis only established upon progression or advanced imaging evaluation.

Discussion

Asymptomatic myocarditis and sudden cardiac death

Myocarditis, especially in young patients, can progress asymptomatically or silently, and patients may not have any obvious cardiac symptoms such as chest pain or shortness of breath, yet it significantly increases the risk of sudden cardiac death (SCD). Evidence from recent studies suggests that the timely diagnosis of these asymptomatic cases is very difficult and is often only diagnosed after cardiac arrest or autopsy. Recent autopsy series confirm myocarditis in 2-12% of SCD in young adults/children, often without prior symptoms, underscoring viral triggers in genetically susceptible hearts (21).

Importantly, myocarditis is not limited to asymptomatic progression toward sudden cardiac death, and a clinically relevant intermediate spectrum also exists. Several studies have reported non-fatal electrical manifestations, including ventricular arrhythmias such as ventricular tachycardia (VT), premature ventricular complexes, and transient conduction abnormalities in patients with clinically “silent” or minimally symptomatic myocarditis. These findings sug-

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gest that electrical instability may occur prior to structural collapse or fatal outcomes, highlighting that myocarditis can first manifest as arrhythmic events detected on electrocardiography or cardiac monitoring rather than sudden death. However, due to the predominance of autopsy-based literature, this intermediate arrhythmic phase is likely underrepresented in the current review.

A critical consideration in interpreting these findings is the predominance of autopsy-based and case report evidence. Such studies inherently focus on fatal outcomes and may overrepresent the most severe and clinically silent forms of myocarditis. As a result, the current body of evidence may not fully capture the broader clinical spectrum, particularly non-fatal atypical presentations that are increasingly recognized in clinical settings. Recent clinical reports and case series included in this review suggest that myocarditis may initially present with subtle or noncardiac symptoms, such as gastrointestinal complaints, and may follow a variable clinical course ranging from full recovery to severe complications. Therefore, while postmortem findings provide valuable mechanistic insights, they may have limited direct applicability to early clinical diagnosis.

In the study by Gaaloul et al. (2021) (11), sudden deaths associated with enterovirus-induced myocarditis were evaluated in terms of histopathology, immunohistochemistry, and molecular pathology. The findings of this study showed that many patients had no obvious clinical manifestations before death, and only postmortem examinations revealed the presence of severe inflammation and myocardial necrosis. These results suggest that viral myocarditis can be completely asymptomatic and lead to sudden death through electrical and inflammatory mechanisms. This pattern of insidiousness was also observed in the study by Ottaviani et al. (2020) (14). This study examined the cardiac conduction system, focusing on patients with arrhythmogenic cardiomyopathy who had sudden death. Even in the absence of any clinical symptoms, pathological findings indicated tissue abnormalities and disruption of the fibrofatty structure, which can lead to acute electrical dysfunction and sudden death. This study demonstrated that even the combination of mild myocarditis with underlying cardiomyopathy can be fatal without prior warning. Callon et al. (2018) (15) also suggested a concurrent role of viral myocarditis and genetic cardiomyopathy in sudden death in an autopsy study. The findings showed that acute viral injury can have devastating effects on the genetic background of reduced cardiac tissue resistance, leading to electrical failure and sudden death even in the absence of any previous symptoms. This pathological interaction suggests that even clinically mild myocarditis in genetic patients can have sudden and unpredictable outcomes. A study by Fnon et al. (2017) (16) also showed that multiple cases of sudden death in a young population in Egypt were due to occult myocarditis. This study, by examining the histological structure of the heart, showed that myocardial inflammation can suddenly disrupt the electrical function of the heart even without causing symptoms in the patient. These data once again emphasize the difficulty of diagnosing occult myocarditis. In a population-based study, Lynge et al. (2019) (5) examined more than 14,000 sudden deaths in people aged 1 to 49 years in Denmark and showed that a significant proportion of these deaths were related to myocarditis. Importantly, the majority of these patients had no previous symptoms and, in many cases, the diagnosis was made only at autopsy. These findings highlight the importance of clinical attention to asymptomatic patients, especially at a young age. In a UK registry, community SCD showed myocarditis in 1.1% of non-hospitalized cases, mostly occult with normal gross hearts (22). These studies collectively demonstrate that myocarditis can progress asymptomatically and increase the risk of SCD even in young patients. The correlation of autopsy findings, molecular data, and population studies provides strong evidence that clinical diagnosis based on cardiac symptoms alone is inadequate.

Myocarditis with nonclassical manifestations, especially gastrointestinal symptoms

In addition to asymptomatic cases, evidence suggests that myocarditis can present with nonclassical manifestations, especially gastrointestinal symptoms. This unusual clinical pattern makes timely diagnosis difficult and, in some cases, delays therapeutic intervention. The reviewed studies suggest that gastrointestinal infections, especially those caused by Campylobacter jejuni and Salmonella enterica, can be associated with initial gastrointestinal symptoms before cardiac involvement, ultimately leading to acute myocarditis.

A study by Costa et al. (2019) (17) reviewed a series of cases of Campylobacter-induced myocarditis and found that patients initially presented with nonspecific gastrointestinal symptoms such as fever, diarrhea, and abdominal cramps, but later developed acute myocarditis. A 16-year-old developed STEMI-like myocarditis post-gastroenteritis, with troponin peaking on day 3 and EF 45%, resolving fully after treatment (23). Suehiro et al (2020) (18) reported a patient with myocarditis secondary to Campylobacter jejuni, whose initial symptoms were only diarrhea and fever, and who presented a few days later with chest pain and elevated cardiac markers. Zouganeli et al (2018) (19) investigated the possible mechanisms of the association between gastrointestinal infection and direct or indirect myocardial injury in a case report, showing that some patients presented with only general symptoms such as weakness, nausea, or fever. Sumana et al (2021) (20) also reported a rare case of myocarditis associated with Salmonella enterica serovar Weltevreden, in which the patient initially presented with only gastrointestinal symptoms and developed heart failure a few days later. Salmonella Berta gastroenteritis led to myocarditis in a systematic review of 28 NTS cases, mostly immunocompetent adults with chest pain mimicking ACS (24).

This evidence suggests that the initial presentation of myocarditis can be entirely noncardiac and often begins with low-risk gastrointestinal symptoms. Therefore, it is essential to pay attention to this clinical pattern to prevent severe outcomes, including heart failure and sudden death. Adenovirus serotype 3 tonsillitis caused fatal pediatric

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myocarditis via uncontrolled inflammation, detected postmortem by PCR despite no prior cardiac signs (25).

Arrhythmic myocarditis post-COVID shows 10.9% SCD rate; risk predictors include VA and low EF, per meta-analysis (4).

Limitations

This narrative review has several limitations. First, the evidence base is predominantly composed of autopsy studies, case reports, and small case series, which introduces a risk of selection bias by overrepresenting fatal and severe cases. Emerging data from global registries (e.g., UK, Denmark) show consistent underdiagnosis, but prospective cohorts are lacking (10). Consequently, non-fatal and clinically diagnosed atypical presentations of myocarditis may be underrepresented. Second, the heterogeneity in study designs, diagnostic criteria, and reporting methods limits comparability across studies. Additionally, potential publication bias and the lack of large-scale prospective cohort studies further restrict the generalizability of the findings to routine clinical practice.

Conclusion

Overall, this narrative review highlights that myocarditis may present across a broad clinical spectrum, ranging from completely silent and asymptomatic forms to atypical presentations with noncardiac manifestations, particularly gastrointestinal symptoms. These heterogeneous and often nonspecific presentations may complicate timely clinical recognition, especially in young individuals.

The available evidence, largely derived from autopsy-based studies, case reports, and case series, suggests that a substantial proportion of myocarditis-associated sudden cardiac deaths occur in individuals without preceding typical cardiac symptoms. In addition, nonfatal reports indicate that gastrointestinal or systemic symptoms may occasionally precede or accompany myocardial involvement, underscoring the diagnostic challenge of this condition. However, these findings should be interpreted with caution, as most of the included evidence is observational and post-mortem in nature, limiting the ability to establish temporal or causal relationships. Therefore, the observed associations should be considered hypothesis-generating rather than causally definitive.

From a clinical perspective, maintaining a high index of suspicion for myocarditis in patients presenting with unexplained, atypical, or gastrointestinal symptoms, particularly in young populations, may support earlier diagnostic evaluation and improved clinical awareness. Future prospective and multicenter studies are needed to better characterize the full clinical spectrum of myocarditis and to clarify its role in sudden cardiac death.

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Conflict of Interests

The authors declare that they have no competing interests.

Authors' Contributions

Concept – R.H., H.B.G., M.R., S.H.S.; Design –R.H., H.B.G., M.R., S.H.S., S.M.H.K., M.M., M.S.; Supervision –R.H., H.B.G., M.R., S.H.S.; Funding –R.H., H.B.G., M.R., S.H.S., S.M.H.K., M.M., M.S.; Materials –R.H., H.B.G., M.R., S.H.S., S.M.H.K., M.M., M.S.; Data collection and/or processing –R.H., H.B.G., M.R., S.H.S., S.M.H.K., M.M., M.S.; Data analysis and/or interpretation –R.H., H.B.G., M.R., S.H.S., S.M.H.K., M.M., M.S.; Literature search –R.H., H.B.G., M.R., S.H.S., S.M.H.K., M.M., M.S.; Writing –R.H., S.M.H.K.

Ethical Considerations

No ethical approval was required for this study.

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Data Availability

Data will be available upon reasonable request from the corresponding author.

AI Use Statement

We have not used any AI in the present study

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